SEARCHING FOR THE CAUSAL IMPACT OF SEX EDUCTION POLICY REFORM: USING A SYNTHETIC CONTROL TO STUDY THE INTERSECTION OF HEALTH & EDUCATION POLICY

Brooke Midkiff

A dissertation submitted to the faculty at the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the School of Education (Policy, Leadership, and School Improvement).

Chapel Hill
2015

Approved by:

Catherine Marshall

Christine Piette Durrance

Dana Thompson Dorsey

Fenwick English

Joanne Hershfield

ABSTRACT

Brooke Midkiff: What is the causal impact of sex education policy reform?: Using a synthetic control to study the intersection of health & education policy
(Under the direction of Catherine Marshall)

Most education policy is targeted specifically at improving education outcomes. Similarly, most health policies target health outcomes exclusively. Using changes in sex education policy, this project seeks to understand the intersection of education policy and health policy. Education and health policy impacts racial or ethnic racial or ethnic minority women disproportionately, as racial or ethnic minority women experience a stronger and more negative education gradient than whites or men. Also, racial or ethnic minority girls experience lower graduation rates than boys or white girls, and have persistently higher rates of teenage pregnancy. For this reason, sex education presents an illustration of the intersection of education and health policy and its possible impact on racial or ethnic minority girls.

To understand this phenomenon, the synthetic control methodology is used to compare the education and health outcomes of racial or ethnic subgroups of girls who received comprehensive sex education to their counterfactual peers. I examine state-level data to construct a synthetic control in which comprehensive sex education was not adopted for comparison to the treatment unit. The synthetic control method is used to examine if a state-level policy change to provide more comprehensive sex education led to better health outcomes as well as educational outcomes, and if any effects of the policy change were heterogeneous between racial and ethnic subgroups.

I provide discussion of my findings as they relate to issues regarding feminism broadly, Black feminist thought, Latina/o critical theory, whole-child school reform approaches, the relationship between high school completion and teenage pregnancy and childbirth, the education gradient, and feminist critical policy analysis.

To Sophia.

"Intellectual freedom depends upon material things. Poetry depends upon intellectual freedom. And women have always been poor, not for two hundred years merely, but from the beginning of time…By hook or by crook, I hope that you will possess yourselves of money enough to travel and to idle, to contemplate the future or the past of the world, to dream over books and loiter at street corners and let the line of thought dip deep into the stream." – Virginia Woolf

ACKNOWLEDGEMENTS

I would like to thank the numerous people who have supported me throughout this endeavor. First and foremost I would like to thank Catherine Marshall, my longtime mentor and advisor. Her guidance as well her strength of character to embrace a feminist practice of entrustment has been incalculably important. Thank you, Catherine, for your support and for being, for me, the "woman who was beside her and who, at the decisive moment, said to her: 'Go on'" (Zerilli, 2005, p. 114). Next I would like to thank Christine Durrance, without whose guidance and technical expertise this project simply would not have been possible. I would also like to thank Fenwick English, Dana Thompson-Dorsey, and Joanne Hershfield not only for their service on my committee but also for the mentoring and advice they have provided.

Additionally I would like to acknowledge the loving support my parents have each individually provided me throughout my doctoral studies. Their help with the perennial issue of childcare has been invaluable.

Lastly I would like to thank my friends who have supported me in this endeavor. Thank you to Tiffany Grant who has provided emotional support and unquestioning understanding through the entirety of my doctoral studies. I would like to thank Maia Call for her friendship and willingness to talk through statistical issues with me. I would also like to thank Keren Daylot for her support and friendship, as well as her valuable insights.

Table of Contents

CHAPTER 1: INTRODUCTION

Much educational research is concerned with improving student achievement outcomes through changes to the curriculum, teacher quality, funding, and a host of other mechanisms through which, scholars theorize, increases in student learning occur. While these traditional reforms, however, play a role in improving education, they fail to address a somewhat obvious characteristic of the learning process – that students are people, and teachers must teach the whole child. Health policies and programs are integrally related to schooling because of the inextricable link between health and education outcomes. Overall, increases in education are correlated with better health, a phenomenon known in the field of health policy as the *education gradient* (Arendt, 2005; Eide & Showalter, 2011; Eide, Showalter, & Goldhaber, 2010; Goldman & Smith, 2011; Hunt-McCool & Bishop, 1998; Jürges, Reinhold, & Salm, 2011; Ross & Mirowsky, 2011). The strength of the correlation varies across subgroups (Kimbro, Bzostek, Goldman, & Rodríguez, 2008; Lauderdale, 2001). In particular, the gaps in the education gradient throughout the United States tell us that minorities with lower education levels and lower socioeconomic levels suffer higher mortality rates – despite the significant decrease in overall mortality rates in the past century (Braveman, Cubbin, Egerter, Williams, & Pamuk, 2010; Pappas, Queen, Hadden, & Fisher, 1993). Along most health indicators, even those with intermediate income and education are less healthy than people of the highest socioeconomic status or with the most education (Braveman et al., 2010).

While the education sector identifies the disparities in educational outcomes between racial or ethnic minority and majority students, the health field concurrently witnesses disparities

in the education gradient between different groups. The education gradient is worse for minorities and women, meaning that worse health outcomes are more strongly correlated with lower educational outcomes – they are negative and larger -- than for whites and men (Kimbro et al., 2008). A stronger correlation of the education gradient for an individual means that it is less likely for that person to be as healthy as someone with a weaker education gradient. For a group, it means higher mortality rates on average than groups with weaker education gradient correlations (G. Conti & Heckman, 2010). Meara et al (2008) report that a person with any college education – not necessarily having completed college – has a likelihood of living an estimated 7 more years than those with only 12 years of education, regardless of race or ethnicity. Further, Olshanksy et al (2012) indicate that African-American women with less than 12 years of education had a lower life expectancy than their white counterparts by 10.3 years, based on 2008 data.

Minority women experience both lower levels of economic returns to education as well as worse health outcomes (Walsemann, Gee, & Ro, 2013). Education has historically, and continues to be, a key indicator of socioeconomic level in health research (Elo, 2009; Kawachi, Adler, & Dow, 2010; Krieger, Williams, & Moss, 1997); however, health indicators seldom guide educational policy scholars. While there are some efforts to address the whole-child in education reform -- for example, the Harlem Children's Zone, the Broader Bolder Initiative, and Comer Schools ("Broader, BOLDER Approach to Education: Home," 2014, "Harlem Children's Zone," 2014; Comer, 1997) -- the current political focus in the arena of education reform remains on in-school interventions designed to improve student achievement, largely in reading and mathematics (Carnoy, Elmore, & Siskin, 2013; Rothstein, 1998). By focusing on a health

aspect, sex education can be understood to fall within the category of whole-child reform approaches to education because it does not directly focus on academic outcomes.

Despite numerous reforms to increase accountability in reading and mathematics, African-American and Hispanic students continue to lag behind their white counterparts in high school completion (Chapman, Laird, Ifill, & Kewal Ramani, 2011; Freudenberg & Ruglis, 2007). Additionally, African-American and Latina girls have higher birth rates among teenagers (C. C. Basch, 2011; Kost & Henshaw, 2013). It is well documented that a child born to an unwed teenage mother is much more likely to become a parent during adolescence themselves (C. C. Basch, 2011; Meade, Kershaw, & Ickovics, 2008). Early parenting is associated with girls' lower educational attainment and overall income later in life (Amato & Maynard, 2007; C. C. Basch, 2011; S. L. Hofferth & Reid, 2002; S. L. Hofferth, Reid, & Mott, 2001; Hoffman, 2006; Hoffman & Maynard, 2008; D. Kirby, 2001; Levine & Painter, 2003; Manlove, 1998).

Completing high school is a clear indicator of future economic success (Bitzan, 2009; K. J. Denny & Harmon, 2001; Hungerford & Solon, 1987; Rumberger & Lamb, 2003; Whitaker, 2011), yet teenage pregnancy continues to be the leading cause of dropping out for girls (Freudenberg & Ruglis, 2007). In fact, it is estimated that between 30-40 percent of total female dropouts are mothers (Brindis & Philliber, 1998). Given this repetitive pattern of early pregnancy and parenting, possibly channeling racial or ethnic minority girls into a "cycle of poverty," it is important to examine if an educational input such as comprehensive sex education is an effective intervention for increasing the high school completion rates of African-American and Hispanic girls. If improvements to educational attainment brought about through a health policy lead to a reduction in the education gradient for racial or ethnic minority women, there exists the possibility to disrupt a pattern of disparities along multiple dimensions through policy actions.

This project seeks to extend research into the intersection of education policy and health policy for racial or ethnic minority women, using changes in sex education policy as an example of such intersecting policies. This project examines the disparity between education and health for racial or ethnic minority girls, utilizing econometric methods for causal inference, to examine if sex education impacts general educational outcomes for racial or ethnic minority female high school students. I will examine two different categories of outcomes: education outcomes and health outcomes -- based on a policy change to comprehensive sex education. For education, I examine high school completion; for health, I examine adolescent birth rates. While other studies have demonstrated that comprehensive sex education leads to reductions in sexual risk-taking behaviors (Lindberg & Maddow-Zimet, 2012; Isely et al, 2010, Mueller et al, 2008, and Erkut et al, 2013), they do not examine if these reductions in risky behaviors translate to a reduction in overall adolescent birth rates.

In order to draw causal inferences, the synthetic control method is used to examine the impact of sex education programs on racial or ethnic minority girls for both education and health outcomes, comparing them to a synthetic control group that did not receive similar changes in sex education instruction. Results of this research will provide a framework for further inquiry into the efficacy of other health policies used within public schools to improve both health and educational outcomes. Lastly, examining if the change to comprehensive sex education in Iowa[1], the state that underwent a policy change in this study, improved both education and health outcomes for racial and ethnic minority women opens the way to further explore policy solutions for reducing the education gradient gap. Iowa previously had abstinence-only sex education,

[1] Further discussion of the rationale for choosing Iowa for analysis is provided in Chapter 3.

before adopting comprehensive sex education; this reflects a shift in programming from excluding information about contraception to including information about contraception.

Sex Education in the United States

I investigate sex education serves because I believe that, as a policy treatment, it has the potential to impact both education and health because it demonstrates a health policy that is implemented in schools. That is, sex education falls within the purview of education policy and health policy. Using sex education as an example is also salient because it speaks to multiple layers of connections between education and health outcomes. Most middle or senior high schools across the country implement some form of sex education in order to reduce unintended pregnancy and STDs among youth (D. B. Kirby, 2008; Landry, Kaeser, & Richards, 1999). The purpose of sex education is to improve health outcomes. However, it is implemented in public schools – an arena purposely dedicated to educational outcomes for youth. Sex education is a useful example of the intersection of health and education policy because of this overlap.

For example, racial and ethnic minorities, specifically Black and Hispanic students, continue to lag behind their white counterparts in high school completion (Chapman et al., 2011; Freudenberg & Ruglis, 2007). Additionally, Black and Hispanic girls have higher birth rates among teenagers than whites (C. C. Basch, 2011; Kost & Henshaw, 2013), and a child born to an unwed teenage mother is much more likely to become a parent during adolescence themselves (C. C. Basch, 2011; Meade et al., 2008). Early parenting is associated with girls' lower educational attainment and overall income later in life (Amato & Maynard, 2007; C. C. Basch, 2011; S. L. Hofferth & Reid, 2002; S. L. Hofferth et al., 2001; Hoffman, 2006; Hoffman & Maynard, 2008; D. Kirby, 2001; Levine & Painter, 2003; Manlove, 1998). With all of these factors taken together, the prior evidence suggests that early parenting is related to poor life

outcomes, and that this affects racial and ethnic minority girls more so than Whites. Therefore, it is important to examine how comprehensive sex education impacts health outcomes such as teenage birth rates, and if these health outcomes affect racial or ethnic minority girls' overall education attainment and achievement.

Context & History

In the United States, sex education evolved during the first sexual revolution during the Progressive era, between 1880 and 1920, under the auspices of the American Social Hygiene Association (ASHA), which was the first organized group to ever advocate for sex education in this country (Luker, 2007). The social hygienist view of sex education was that the American public should be educated about sex. However, they had to contend with a sexual double standard in which prostitution was considered necessary for men, and women needed to be protected from ungoverned male desire (Luker, 2007). According to Foucault (1990), the social hygienists' denouncement of a conspiracy of silence around sex suggests that their campaigns were disingenuous because they generated prolific discourses about sex. However, Luker (2009) interprets the social hygienists' activities to suggest that they were challenging a male view of sex and procreation and substituting for it a female viewpoint.

Sex education expanded between World War I and the 1960s to include preparation for marriage, attempts to discourage premarital sex, and training for responsible parenthood (Luker, 2007). Still largely influenced by the American Social Hygiene Association, sex education became conflated with "family life education" – programs that were touted to remedy nearly all perceived social ills including divorce, masturbation, lack of self-control in sexual and financial life, sexual maladjustment, delinquency, crime, and inter-racial marriage (Luker, 2007). The

sexual revolution of the 1960s began to change the views set forth in sex education, just as it changed views around many aspects of gender. Luker (2007) describes this time period:

> It is in this sense of the word that the 1960s were so revolutionary, because for the first time since the days of social hygiene, ideas about gender and sexuality were called into question, and thus power relations between men and women were questioned too (p.71).

The new generation of sex educators during the 1960s viewed sex outside of marriage for young people as inevitable, and therefore viewed sex education's purpose as making sex safer rather than reinforcing cultural norms of heterosexual marriage (Luker, 2007). In 1964, Dr. Mary Calderone, a former Medical Director for the Planned Parenthood Federation, founded the Sex Information and Education Council of the United States (SIECUS) (Luker, 2007; "SIECUS - History," n.d.). Although clearly grounded in the foundations of social hygiene that dominated sex education and Planned Parenthood in the early 1900s (Luker, 1985), Dr. Calderone's new organization was forward thinking and advocated that sex education should be primarily focused on reducing the risks of sexuality outside marriage among young people (Luker, 2007).

During the 1970s to early 1980s, there was a great deal of consensus across the United States that sex education could and should address the issues of teenage pregnancy and HIV/AIDS – two social problems that seemed to be reaching epidemic proportions (Luker, 2007). However, this consensus was short-lived as the Christian Right began to rise in politics, and successfully advocated for morality-based approaches to sex education. The result of their political efforts was the Adolescent Family Life Act (AFLA) of 1981, which effectively transferred federal money from comprehensive sex education to pro-family organizations that would provide "abstinence-education" instead (Luker, 2007). By tying federal dollars to the type of sex education provided by the states, the nature of sex education on average across the country has been dominated by abstinence-only types of programs since the early 1980s. As part of this

national trend, Iowa offered abstinence-only sex education until the mid 2000s.[2] Table 1 presents issues pertinent to the state of sex education across the country since the 1980s. While some states chose to reject federal funds in order to restore comprehensive sex education, most did not. However, beginning in 2010 federal funding for sex education was re-routed from primarily abstinence-only programs to comprehensive programs.

Current Policies

While the right and responsibility for the provision of education is given to the state, rather than the federal government, funding mechanisms for certain educational goals tend to steer states towards federally crafted objectives[3]. This has been the case for sex education policies as states have been tied to federal funding for abstinence-only education. Table 2 provides the most updated summary available of types of sex education for each state ("Sexuality and HIV/STD Education Policies," 2012). I provide this information to show the current policy context. The most current data available regarding the state of the states' sex education programs suggests that a little less than half of states require or allow sex education that provides information about contraception to students.[4]

Research Objectives

The primary goal of this research is to answer the following policy question:

---

[2] Discussion of the year during which the policy change happened and the context of the policy change in Iowa is provided in Chapter 3.

[3] For example, Title I funding in conjunction with the accountability requirements of No Child Left Behind.

[4] Data on states that leave sex education policy to local education agencies (LEAs) is available from SIECUS and the Guttmacher Institute, and has been compiled for the years 2003-2008. In most cases, states that do not mandate sex education provide state-level policy guidance to LEAs in their decision-making regarding sex education.

1. Did Iowa's policy changes to sex education improve health and education outcomes for female adolescents, particularly for racial and ethnic minorities?

Specifically, this project examines whether or not the adoption of comprehensive sex education in Iowa led to changes in the high school completion rates of racial or ethnic minority girls. In addition to impacts on educational outcomes, this research also explores the impact of the policy change on adolescent birth rates, and in turn the overall relationship between education outcomes and health outcomes for racial or ethnic minority women.

Further research questions include the following:

2. Did the policy change to sex education in Iowa impact all subgroups (by race and ethnicity) the same or differently in education outcomes as measured by graduation rates?
3. Did the policy change to sex education in Iowa impact all subgroups (by race and ethnicity) the same or differently in health outcomes?

This project will begin to fill a gap in the extant literature around the nature of the intersection of health and education policies, and the implications of those intersections for minorities. This example – comprehensive sex education -- provides a basis to begin examining if policies that promote health programs inside public schools can be an effective way to improve both health and education outcomes.

Definitions for use in the project

For clarity and consistency throughout this research project, the following important terms are defined: education gradient, comprehensive sex education, abstinence-plus education, and abstinence-only education. The definitions given here are consistent with the extant literature, but providing specific definitions is useful for reference throughout the project and for clarity as

some terms are used inconsistently in scholarship that traverses different disciplines (i.e. education, health policy, and gender studies).

Education gradient

One way of conceptualizing the education gradient is the difference in life expectancy and overall health status between groups of different educational attainment levels (Cutler & Lleras-Muney, 2010). The gradient itself refers specifically to the relationship between education and health behaviors that ultimately impact life expectancy. For reference, a simple example of the education gradient is as follows: as of 1990 a 25-year-old male, college graduate could expect to live a full 8 years longer than a male student who dropped out of high school (Richards & Barry, 1998). This difference in life expectancy by education level is persistent (Elo & Preston, 1996; Kitagawa & Hauser, 1973; Meara et al., 2008).

In their examination of the education gradient, Cutler & Lleras-Muney (2010) demonstrate that income, health insurance, and family background account for approximately 30 percent of the gradient, while knowledge and cognitive ability account for an additional 30 percent of the gradient. Their basic estimation strategy, though modified through different specifications throughout their research, is based on the following regression:

$$H_i = \beta_0 + \beta_1^* Education_i + X_i\alpha + \varepsilon_i$$

where H_i is a health behavior of individual *i* and the education gradient is given by β_1, which measures the effect of schooling (by a variety of measures in different specifications used by the authors) on the health behavior (defined and measured in variety of ways across different specifications by the authors) (2010, p. 2). They control for numerous explanatory variables, re-estimating the basic equation to:

$$H_i = \alpha_0 + \alpha_1^* Education_i + X_i\alpha + Z_i\gamma + \varepsilon_i$$

where Z_i represents various explanatory variables. For each health behavior (H_i), they report the percent decline in the coefficient of education (α_i^*) that occurred from adding each set of explanatory variables with:

$$1-\alpha_1/\beta_1$$ (Cutler & Lleras-Muney, 2010, p. 2).

For the purposes of this research project, the education gradient is conceptualized as essentially this same basic equation – the effect of education on health. However, the phenomenon of the education gradient is not part of the analysis of this project. I provide a definition here for clarification for the motivation for examining health outcomes from an education policy.

Education gradient gap

The education gradient gap refers to the difference in the strength and magnitude of the association between education and health between different subgroups. For example –higher levels of education positively impact White males' health somewhat, but lower levels of education negatively impact Black females' health substantially. The education gradient gap is a term that is used to refer to the differences in covariance of education and health between subgroups.

Comprehensive sex education

The definition used in this project for comprehensive sex education is drawn from the definition given by the Sexuality Information and Education Council of the United States (SIECUS), but is also representative of the general use of the term throughout the literature. SIECUS defines comprehensive sexuality education as:

> ...programs that start in kindergarten and continue through 12th grade. These programs include age-appropriate, medically accurate information on a broad set of topics related to sexuality including human development, relationships, decision-making, abstinence, contraception, and disease prevention. They provide students with opportunities for

> developing skills as well as learning information ("SIECUS - Sexuality Education Q & A," 2014).

For this project, I limit comprehensive sex education to those programs to those that broadly provide information on sexuality, contraception, and disease prevention as the focus of the program. Any mention of abstinence behaviors is secondary to medically accurate information about sexuality, sexual health, contraception, and disease prevention.

Abstinence-plus sex education

I draw from SIECUS's definition of abstinence-plus sex education as well. Their definition is as follows:

> Programs that emphasize the benefits of abstinence. These programs also include information about sexual behavior other than intercourse as well as contraception and disease-prevention methods. These programs are also referred to as abstinence-plus or abstinence-centered ("SIECUS - Sexuality Education Q & A," 2014).

This is the working definition used throughout this project to refer to this particular type of sex education. Abstinence-plus programs can be conceptualized as falling in between fully comprehensive sex education and abstinence-only sex education – they include information on both abstinence and contraception, but with an emphasis on abstinence and decision-making skills.

Abstinence-only sex education

The definition of abstinence-only sex education is taken directly from Title V of the Social Security Act §510 (b)(2)(a-h):

> (2) For purposes of this section, the term "abstinence education" means an educational or motivational program which—
>
> (A) has as its exclusive purpose, teaching the social, psychological, and health gains to be realized by abstaining from sexual activity;

(B) teaches abstinence from sexual activity outside marriage as the expected standard for all school age children;
(C) teaches that abstinence from sexual activity is the only certain way to avoid out-of-wedlock pregnancy, sexually transmitted diseases, and other associated health problems;
(D) teaches that a mutually faithful monogamous relationship in context of marriage is the expected standard of human sexual activity;
(E) teaches that sexual activity outside of the context of marriage is likely to have harmful psychological and physical effects;
(F) teaches that bearing children out-of-wedlock is likely to have harmful consequences for the child, the child's parents, and society;
(G) teaches young people how to reject sexual advances and how alcohol and drug use increases vulnerability to sexual advances; and
(H) teaches the importance of attaining self-sufficiency before engaging in sexual activity (*Social Security Act*, n.d.).

This definition is taken directly from the text of the law that authorizes federal funding for these types of sex education programs. This definition is often referred to as the "(a)-(h)" definition of abstinence-only education. Per the requirements of the law, sex education that meets the definition of abstinence education does not include mention or discussion of contraception methods.

Minority

For the purposes of this study, the term racial or ethnic minority includes groups that do not identify themselves as White / non-Hispanic. However, this project has a focus specifically on Black and Hispanic students. Since these two groups are the largest racial or ethnic minority groups in aggregate across the nation they are the most readily available for analysis. Other racial or ethnic minority groups frequently are present in too few numbers for state-level, aggregate data analysis.

Graduation rates

As explained in in detail in Chapter 2, dropout rate data contain serious flaws as a data point in reflecting the actual number of students who fail to complete high school and receive a high

school diploma. Additionally, including GED recipients as high school graduates is not an accurate measure of the graduation rate nationally, again explained in detail in Chapter 2. Therefore, for the purposes of this study, the term graduation rates refers to the proportion of the number of students enrolled in a high school in Grade 12 to the number of students who finish high school with a high school diploma (as opposed to GED completers or dropout rate data) in the same year.

Achievement gap

The achievement gap typically refers to the difference in school completion between different racial, socioeconomic, and gender groups. The term "achievement gap" in education is most commonly used to refer to the difference between White and Black attainment (high school gradation, college graduation, etc.) as well as achievement (standardized test scores); however, more recent literature has begun to focus on the larger and growing achievement gap between socioeconomic groups (Duncan & Murnane, 2011). For this project, I focus on the achievement gap between racial and ethnic minority subgroups and Whites, in the area of graduation rates.

Economic returns to education

For this project the phrase "economic returns to education" refers to the increases to both potential and real wages that are associated with higher levels of education. Economic returns to education are not conceptualized as static at varying credentials or years of education, but are instead assumed to vary by individual characteristics such as race, class, and gender. A more detailed discussion is provided in Chapter 2.

Cycle of poverty

The cycle of poverty refers to the theory that children of women with low levels of education and who are poor, systematically move into the same life patterns due to structural inequities. The utility of this theoretical framework and challenges to it are discussed in Chapter 2 and then revisited in Chapter 5.

Significance of the study

Health policy and education outcomes

The primary purpose of this study is to empirically examine the efficacy of comprehensive sex education on improving educational and health outcomes. Particularly, there is substantial evidence that high school graduation is disproportionately important to labor market returns for disadvantaged students, and that poor and racial or ethnic minority students disproportionately do not graduate from high school. Given that pregnancy is a leading cause for female high school dropout, it is important to understand whether or not comprehensive sex education can serve as an effective mechanism for improving educational outcomes. As discussed in depth in the review of the literature in Chapter 2, comprehensive sex education is a relatively cost-effective approach in comparison to other "whole-child" reforms, and it situated inside of schools -- a feature of health interventions that is shown to be most effective at improving educational outcomes.

While a randomized control-trial would be the optimal way to obtain solid, empirical evidence on the efficacy of comprehensive sex education on educational and health outcomes, it is infeasible with respect to sex education. Therefore, the strongest research design to examine this policy question is a quasi-experimental design whereby a counterfactual can be examined for comparison. Using the synthetic control method to compare Iowa to its counterfactual self allows

us to gain stronger evidence of the effects of state policy changes to sex education on state-level education outcomes.

Feminism

The topic of sex education is one often emotionally charged due to the underlying issues that it brings to light – disagreements over sexual morality, the state and specifically the public schools' role in teaching about health and medical topics, as well as teaching children about morality around sex and sexuality. The topics and types of sex education programs often find great disagreement among feminists who differ on the definitions and paths to "empowered sexuality among adolescent girls" (Lamb & Peterson, 2012, p. 703). However, a progressive view of sex education is consistently a feminist agenda. Sex and sexuality cuts to the core of gender issues, power differentials, and different experiences in life due to differing gender identities and expressions. Prominent sex education scholar Jessica Fields writes that "In a critical feminist sex education program, students and teachers would confront and strive to suspend – even momentarily – the sexism, racism, classism, and heterosexism inside and outside the classroom" (Fields, 2008, p. 36). Sex education, then, is a forum for striving for social justice in realms beyond sexual life.

In her monograph on sex education in the United States, Luker (2007) draws out the connection between feminism and conflicting ideologies over sex education. She writes:

> Blackstone, the famous seventeenth-century legal theorist, stated clearly that women were the property of their fathers until wed and then became the property of their husbands. "Unchastity," which meant a woman made her own decisions about whom to have sex with, was a crime against property, namely the property that men held in women. Thus, when feminists agitated on a range of issues, including birth control, abortion, and rape, they were challenging the belief that women, unlike men, held no property in themselves (Luker, 2007, p. 203).

This poignantly highlights how sex education that does not emphasize abstinence until marriage is a feminist cause – it re-frames sexuality to see women as having property rights in themselves.

This study has an important contribution to make with regards to feminist scholarship in education and health policy. Sex education, denoting the complexities of gender identity and sexuality, is a space for feminist thinking to make progress towards creating a more socially just world. The fact that educational and health disparities are suffered primarily by the poor, minorities, and differentially based on gender makes this project an important feminist endeavor.

CHAPTER 2: REVIEW OF THE LITERATURE

In order to fully contextualize this study, it is necessary to review the literature around several major thematic areas. First I provide a brief overview of sex education in the United States, along with feminist frameworks for understanding gender and sexuality, and with feminist influences on sex education. Then I address the extant literature around different types of sex education, including what is known about the efficacy of each type. Next I address the scholarship around the education achievement gap and its relationship to teenage pregnancy. Then, I provide a review of the literature about the education gradient as it relates to minorities and women, and what is known about the education gradient more broadly. Lastly, I conclude the review of the literature by examining other policy approaches to improving student achievement through mechanisms not constrained to directly education-related interventions. I provide a broad overview of the literature around these "whole-child" approaches to education policy innovation in order to offer the context into which this study fits.

Sex Education in the United States & Feminism

A Brief History of Sex Education in America

In examining government policies about sex education within public schools it is useful to frame thought about current policies within a historical context. For this purpose, I give a brief overview of the history of sex education within the United States, looking back to the Progressive Era through the conservative backlash of the 1980s through present day. Historically, sex education in the U.S. has been typified by an emphasis on behaviors, the attempt to direct behaviors (Goldfarb & McCaffree, 2000). By situating the discussion of current

policy within this historical context, we are better able to understand how both the national and regional debates over sex education came to where they are today – a space of discord and seemingly incompatible values and beliefs, where it seems that opposing groups are incapable of reaching any consensus on what sex education is or should be in the United States.

The reason for this is perhaps best explained by scholar Cornelia Pillard (2007) in her legal study of reproductive rights and sexual equality: "Sex education lies at the crossroads between reproductive rights and sex equality…sex education is a critical site of acculturation regarding both reproduction and sex roles" (p. 946). The debates about sex education are about more than the content of curriculum units. They are debates about societal values and socially acceptable male and female roles. The values in conflict are those that seek to preserve a patriarchal view of family and marriage and those whose highest value is on women's equality and reproductive rights. Similarly, as Rose (2005) points out in her research on attitudes towards teen sexuality, "the renewed efforts to undermine sex education are not just about sex; they are part of a broader challenge to public education which centers around parents' vs. children's and states' rights" (p. 1217). By looking back at the policies of the past regarding sex education, we can begin to understand how and why sex education today symbolizes more than a simple debate over whether or not students should learn about condoms. Laws regarding sex-based topics and education reflect a cultural history in which women are viewed primarily as mothers and caretakers while men are viewed as breadwinners, free of the constraints of family responsibilities (Pillard, 2007). This cultural framework has shaped the politics and policies of sex education throughout history and continues to influence policy today.

The debate over sex education can be traced back to 1839 when the American Female Moral Reform Society began to systematically campaign against prostitution and also attacking

sex-based double standards within society (Ehrlich, 2006). This group could be seen as a coalition politicking from the margins at the time, but as history shows, the pendulum of dominating policy actors swings with regularity with sex education. The campaigns of the early 1800s were based in the idea of female chastity and purity and called for changes in male behavior to protect women as sexual victims (Ehrlich, 2006). Given that during this time women were legally viewed as property, this was quite a radical stance. From this public campaign, the discussion evolved to include debate over the age at which a woman can *consent* to sexual activity, and so political attention turned to the role of the state in protecting women under a certain age from the sexual predations of male citizens (Ehrlich, 2006). Age of consent laws became widespread in the 1880s, marking the first large-scale involvement of the government in the private lives of women (Ehrlich, 2006). That is, the age of consent laws marked a turning point in public policy in that they "transformed what had been largely a private concern – female sexual behavior – into a matter of public policy" (Ehrlich, 2006, p. 157). This would not be the last time that public policy made itself known in the realm of private, female sexual behavior.

During the early 1900s, the government became increasingly involved in monitoring and safeguarding the sexual behavior of women (Ehrlich, 2006). However, it is during this time period that the view of women as "sexual victim" shifts to "sexual delinquent" and public policy moves in the direction of preventing girls from becoming "sexually delinquent," protecting her from herself, ensuring that she does not ruin her entire future and life (Ehrlich, 2006, p. 158). It is not until the cultural revolution of the 1960s that society began to question this point of view.

The shift in public policy can be marked by President Johnson's "War on Poverty," begun in 1964, which was grounded in the belief that poverty was primarily caused by poor women having too many children (Ehrlich, 2006). Specifically, it was during this time period in

which the "teenage motherhood" emerged as a social problem in and of itself. This is rather surprising given that overall birth rates to teens were at historic lows and were stable; however, the overall number of adolescents at the time meant total numbers of teen pregnancies increased, even though the rate of occurrence was historically low (Pillow, 2004). Because of beliefs around the causes of poverty, the policy solution chosen was essentially extensive family planning services, with the federal government offering significant subsidies to ensure that poor women had access to contraception. Therefore, beginning in 1964, the federal government actively supported, both with policy and finances, contraceptive and family planning services (Ehrlich, 2006).

By the 1970s, pregnant teenagers became, to many people, a symbol of the social unrest and disorder within the United States (Ehrlich, 2006). Discourse surrounding "Welfare Queens and unwed mothers" served to stigmatize women in poverty who could not support themselves, placing them as scapegoats for the public (Tapia, 2005, p. 8). It is in this context that the backlash against federally sponsored contraception occurred. With President Reagan, the dominant discourse in the United States surrounding sex education and the role of the government became focused on morality. As a response to public discontent with federal dollars funding contraception, President Reagan pledged to redirect funds to programs that stressed morality and abstinence. The result of this effort was the Adolescent Family Life (AFL) act of 1981 which block granted funding to states that taught explicitly abstinence-only sex education curriculum (Young & Goldfarb, 2000). Funding for these programs came from programs that supplied information about family planning and contraception to low-income women. Further support for moving in this policy direction came in 1996 with the Welfare Reform Act, which further defined what states could and could not teach about sex if they were to receive federal

funding (G. Denny & Young, 2006). The law specifically delineates in its famous (a)-(h) definition that sex education curricula must promote abstinence before marriage as the expected social norm (Personal Responsibility and Work Opportunity Reconciliation Act of 1996) thus silencing female students who might choose to engage in sexual activity and all students who do not presuppose heterosexual marriage as a life outcome. It is within this context that current state politics about sex education occur.

Feminist Frameworks of Sexuality

Perhaps the most well known feminist contribution to understandings of gender and sexuality is the work of Judith Butler. Her foundational text *Gender Trouble* provides understanding of gender as constructed by society and language, not limited to biological factors. Butler (2006) writes, "…gender is always a doing, though not a doing by a subject who might be said to preexist the deed…There is no gender identity behind the expression of gender; that identity is performatively constituted by the very "expressions" that are said to be its results" (p. 34). In summary, for Butler, and for most feminist scholars who have been influenced by her work, gender is not male or female by way of biology – it is an enactment of identity, and the very enactment of gender identity continually constitutes one's gender identity.

This understanding of the complex nature of what gender is and how it operates in society does not bode well for a project that classifies students as either male or female. Obviously such a binary coding goes against feminist understandings of what gender *is*. However, though gender is complex construct – a *doing* rather than a state of *being* based on Butler's (2006) work – more complicated than two choices: male or female, gender yet constructed under this binary in traditional social science, does exist and in fact dominates sex education policy-making and discourse. There are surveys and standardized tests that require

students to bubble in either male or female. And there are trends in educational, social, and health outcomes related to which bubble an individual chooses. Understanding that gender is complex does not excuse feminists out of dealing with the issues and implications of gender, as it is understood by current social systems. That is, as feminist scholars have turned to issues of the body (see Beauvoir, Borde, & Malovany-Chevallier, 2011; Butler, 2006; Hewitt, 2010) – discussions that are no doubt valuable and important to improving our understanding of gender and how it operates in society – unresolved questions of the body should not impede scholars from continuing work to research and understand tangible, material ways in which the lives of women can be improved through social policy.

Feminist Movement's Influences On Sex Education

One important contribution from feminist scholarship on the understanding of sex, sexuality, and gender is the construction of woman as subject rather than object. Feminists have highlighted ways in which women have been socially and discursively placed outside of agency – situated as objects to which things are done rather than actors who make choices --, particularly around sexuality. Narratives about adolescent sexuality highlight the differences between hegemonic notions of female sexuality and feminist notions of female sexuality. Michelle Fine (2003a) describes how "unacknowledged social ambivalence about female sexuality which ideologically separates the female sexual agent, or subject, from her counterpart, the female sexual victim. The adolescent woman of the 1980s is constructed as the latter. Educated primarily as the victim of male sexuality, she represents no subject in her own right" (p.39).

This framework has largely structured sex education through the eras of predominantly abstinence-only education, wherein girls are taught they must say no, and find ways to stave off male sexual attention so as not to be victimized. A feminist construction of female sexual agency

offers girls the role of subject – making choices and decisions about her sexual health, pleasure, and reproduction. In identifying the varying social discourses around teenage pregnancy, Luttrell (2003) explains that one of the less popular framings is that of the "wrong-society" whereby social inequities are seen as largely the causes of teen pregnancy. Petchesky (1990) was one of the first feminists to set forth a feminist position on teenage pregnancy, taking issue with the discourse of "right and wrong choices," and arguing instead that sexual choices are deeply intertwined with a girl's access to material resources – both overall and opportunities for birth control methods – and conditions surrounding girls' sexual choices are contextualized between unequal power relations between men and women.

Feminists have drawn attention to the ways in which female subjectivity (as agent rather than object), are placed in jeopardy by the structural facts of girls' lives. When one does not have basic necessities in life, or when one does not have access to birth control methods or education about them, or when one has little power within the sexual relationship -- how can one make a choice as a free, independent subject? Studying teenage pregnancy at the individual level, focusing on individual choices, steers the conversation away from these structural issues.

This question of girls' sexual agency and empowerment goes right to the heart of many sex education debates. These debates can by categorized as disputes between the role of the state versus the family in sexuality education, debates between the view of female sexuality as a right versus female sexuality as the harbinger of social morality, or debates between whether information leads to more sexually promiscuity or if more information leads to more cautious behavior among teens. Luttrell (2003) suggests that education policy is particularly vulnerable to these debates writing, "Caught between the demands of constituents on both sides of the debate, and expectations to respond each time a new demand is made (or contested) about how to best

serve the health and sexual needs of adolescents, schools have perhaps intentionally avoided developing clear policies and practices…" (p. 15). In addition to coping with competing demands for responses to community and government ideologies about adolescent sexuality and the role of schools, many education institutions strive to remain out of the fray – to maintain political neutrality. In terms of sex education, this often results in omission rather than inclusion. Fine (2003b) describes how "Many would probably not have considered conversations about social class, gender, or race politics relevant to their courses or easily integrated into their curricula. Some would argue that inclusion of these topics would be "political" – whereas exclusion was not" (p.21). However, the decision to exclude topics is a decision to silence them, and an act of silencing too is a political act.

In fact, much of the debate over the content of sex education programs has to do with silencing. Proponents of abstinence-only education seek to silence talk about contraception, and allow only talk about abstaining from sexual activity. Nearly all sex education programs still silence topics such as compulsory heterosexuality, homosexuality, intersex, and female sexual desire and pleasure. One could describe the case of sex education as fundamentally about silence in the true Foucauldian sense. Silence about topics is what differentiates types of sex education from one another. As Foucault (1990) understands it, silence operates as an instrument of power, regulating what is permissible to say and by whom. He writes:

> Silence itself – the things one declines to say, or is forbidden to name, the discretion that is required between different speakers – is less about the limit of discourse, the other side from which it is separated by a strict boundary, than an element that functions alongside the things said, with them and in relation to them within over-all strategies. There is no binary division to be made between what one says and what one does not say; we must try to determine the different ways of not saying such things, how those who can and those who cannot speak of them are distributed, which type of discourse is authorized, or which form of discretion is required in either case. There is not one but many silences, and they are an integral part of the strategies that underlie and permeate discourses (p.27).

We see this borne out in sex education policies that regulate what can and cannot be spoken of regarding sex. These policies sometimes make silence explicitly required, while sometimes only make explicit which discourses are authorized and sanctioned by the state. Foucault (1990) discusses the entry of the state into the discourse-to-power relation with regards to sex and sexuality, describing how it was during the end of the eighteenth century with the emergence of a new "technology of sex" that "through pedagogy, medicine, and economics, [it] made sex not only a secular concern but a concern of the state as well; to be more exact, sex became a matter that required the social body as a whole, and virtually all of its individuals, to place themselves under surveillance" (p. 116).

The Foucaultian notion of sex as under surveillance of the state permeates the issues around sex education in the United States. Mayo (2007) offers a comprehensive overview of the debates surrounding the content of sex education and lends insight into the ways in which schools operate in Foucaultian state surveillance of sex:

> Schools play a role in demarcating proper from improper identity and inscribing boundaries around particular identities and activities. When curricula limit their discussions of "sex" to heterosexual intercourse they mark out for students what ought to properly be considered sex, thus denying the safer potential of non-penetrative sex and denying the existence of same-gender sexual activity (p. 28).

The public school becomes the site at which the state incites or forecloses discourse around sexuality and social norms. When people disagree over what sexual norms are or ought to be, that disagreement goes to the site at which young people learn them – the public school. Hence the fierce debates over what should and should not be included in sex education programs.

A good example of this dynamic and the role of silence with regards to sex education can be found in Fine's (2003b) ethnography of a public high school in New York City. She shares from her field notes the following episode:

> Field Note: June, 1984
> Mr. Stein: Sure you can do your research on dropouts at this school. With one provision. You cannot mention the words *dropping out* to the students.
> MF: Why not?
> Mr. Stein: If you say it, you encourage them to do it.
> …My field notes continue: "When he said this, I thought, adults should be so lucky, that adolescents wait for us to name the words *dropping out*, or sex, for them to do it" (p.18).

In sum, what is said at school is thought to authorize and endorse social behaviors, and it is for this reason that proponents of abstinence-only education advocate withholding information about contraception and abortion.

Feminist critical policy analysis

By using a causal model, I demonstrate that feminist critical policy analysis need not be limited to unpacking discourses, telling individual lived-experiences, or revealing social power structures through linguistic analysis – all worthwhile and important endeavors --, but that we can also prove mathematically differential impacts of policy changes and answer scientifically important feminist questions. This project aims to demonstrate that the feminist concept of intersectionality can be confirmed through causal modeling to show that policies affect individuals based on their gender, race and ethnicity, and social class – that where a person is located within the matrices of power within society matters. This is an important idea that feminist scholars have supported for some time. This study adds to their efforts by providing traditional policy analyses methods (i.e. econometric causal methods) to evidence what feminists have long theorized, studied, and discussed.

Pillow's (1997) feminist critical policy analysis of teen pregnancy and schooling provides a counter-narrative to the typical view of who a pregnant teenager is and how she interacts with schooling and programs put in place specifically to assist pregnant teens. Pillow (1997) writes of Kathy and how she seemed to fit the normative profile of a pregnant teenage: "troubled home

environment, mother and siblings who were teen parents, low self-esteem, poor student, seemingly unambitious, unsteady relationship with her boyfriend, previous involvement with drugs, and sexually active as a victim at an early age" (p. 135). In short, Kathy fit the profile and participated in a program designed specifically for girls like her. However, after participating for a short time and being interviewed by Pillow on several occasions, Kathy simply disappeared – never recorded as a dropout, but also never located by Pillow or any of the school faculty or staff. This perplexing response to a program and policy designed specifically for her led Pillow to feminist genealogy of teen pregnancy as a policy issue in order to "trace how we define what we think we know about teen pregnancy" (p. 142). Pillow (1997) argues that "A feminist analysis in this sense would seek to interrupt and disrupt the circularity of assumptions abut the authentic experiences of teenage pregnancy by examining assumptions about gender roles and sexuality. In a society that assumes heterosexuality, assumes childbearing as a part of a woman's life and assumes male power…teen pregnancy programs are developed with little or no attention given to both the normative and proliferative affects of gender on teen pregnancy" (p. 143). I would suggest that Pillow's (1997) examination of Kathy and the policies designed for her achieves these purposes. However, there is more to be covered beyond deconstruction. There is a need for construction.

Pillow's (1997) analysis lends feminist insight into important technical aspects of policy analysis for construction of better policies. Specifically, Pillow (1997) reveals how Kathy disappeared, yet never was recorded as having dropped out. This aspect of the case study points feminist scholars to account for those girls who have gone missing after becoming pregnant – those who are forgotten and not counted in school data on dropouts or non-completers. Feminist scholars recognize the ways in which girls are marginalized – pushed out of the numbers – due to

pregnancy. This project brings this feminist learning to bear in the methods of estimation used to calculate graduation rates. Understanding not only the important differences (in terms of economic returns and sheepskin effects) between a high school diploma and a GED, how those differences intersect with race and gender, and how girls in particular are not counted in dropout rates, a feminist examination of sex education effects on education attainment takes into account these issues. I undertake measures to accurately encapsulate those girls lost from the dropout data; specifically, I use high school completion rates rather than drop out rates as drop out rates frequently do not account for students who simply do not return and only include students who officially dropped out.

Additionally, Pillow's (1997) case study of Kathy enables her to ask: "Who is being served by this teen pregnancy program? Who is the policy set up to really benefit and what hegemonic power relations operate in this process?" (p. 147). I suggest that these questions evolve out of Pillow's (1997) use of feminist critical policy analysis and her use of critical theory to deconstruct the program and how it failed to adequately serve Kathy. I also suggest that such questions are not limited methodologically to ethnographic inquiry. I propose that the numbers also tell a story – a story that allows us to question whom comprehensive sex education policy really serves. This has to do with the distribution of power in society. If changing sex education to comprehensive rather than abstinence education benefits some groups more than others – specifically, if it benefits the children of those with power and privilege – it will have an easier political path. If, however, comprehensive sex education disproportionately impacts the children of historically marginalized and silenced groups, narratives to advance the policy must be altered. Since narratives greatly impact political thinking and viability (Lakoff, 2009), this project enables those who seek to advance the cause of social justice to better understand the

power dynamics at work, and thus provides guidance towards the kinds of narratives that may be the most useful for advocacy.

The Types and Efficacy of Sex Education Programs

In order to organize my discussion of the extant literature on the efficacy of various sex education programs, I first present a typology of the three major forms of sex education policies. The descriptions of the types of sex education presented in Table 3 below are in line with descriptions given in Chapter 1.

Most research on the efficacy of sex education programs examines the effect of either receiving or not receiving formal sex education or compares the effectiveness of different types of sex education. One recent example is research by Lindberg & Maddow-Zimet (2012) that examined whether formal sex education is associated with sexual health behaviors and outcomes by using recent national survey data. The authors conducted weighted bivariate and multivariate analyses to analyze data on 4,691 participants, ages 15-24, from the 2006-2008 National Survey of Family Growth (Lindberg & Maddow-Zimet, 2012). The authors estimate the associations of sex education by type, using much the same typology given in Table 1, before first sexual intercourse and other sexual behaviors and outcomes. They tested associations by gender as well to see if the type of formal sex education received impacted females and males differently. Their analysis suggests that all participants who received abstinence-plus sex education were statistically significantly more likely to use any contraception at first sex, use a condom during sex, and were less likely to have an age-discrepant partner[5] (Lindberg & Maddow-Zimet, 2012).

[5] Having a sexual partner of a significantly different age is a well-established risk factor for unwanted pregnancies and HIV and STI transmission.

Specifically for females though, condom use at first sex was significantly more likely for those who received abstinence-plus sex education than those receiving abstinence-only sex education (Lindberg & Maddow-Zimet, 2012). The longer-term outcomes the authors examined included whether or not participants were ever pregnant, had six or more sexual partners, and if participants had received treatment for an STI within the past 12 months (Lindberg & Maddow-Zimet, 2012). These were all mediated by age at first sex, with younger age at first sex more strongly associated to worse long-term outcomes, and had no association with the type of formal sex education received (Lindberg & Maddow-Zimet, 2012).

Another study uses the same typology presented in Table 1 as a framework for examining the differing impacts of different types of sex education. Isley, Edelman, Kaneshiro, Peters, Nichols, & Jensen (2010) used a cross-sectional, nationally representative database, Cycle 6 of the 2002 National Survey of Family Growth, to examine the relationship between formal sex education and the use of contraception at first sex among adolescent females. Isley et al (2010) used multiple logistic regression with adjustment for sampling design on a sample of 1150 adolescent females to measure associations between demographic, socioeconomic, behavioral variables and sex education. Their analysis suggests that there is not an association between the type of formal sex education and contraceptive use at first sex; however, they do find evidence of an association between abstinence-messaging and *decreased* reliable contraceptive use at first sex (Isley et al., 2010).

Also using data from the 2002 National Survey of Family Growth, Mueller, Gavin, & Kulkarni (2008) demonstrate that formal sex education is likely to reduce sexual risk behaviors -- such as using contraception at first sex or delaying sexual initiation –if it is provided before sexual initiation. That is, the author's multivariate analysis suggests that formal sex education for

younger youth are most effective at changing sexual behaviors. Additionally, and importantly for this study, Mueller, Gavin, & Kulkarni (2008) also discuss that formal sex education seemed to have a stronger impact on subgroups that have historically experienced higher risk for early initiation of sex as well as contracting sexually transmitted diseases. Their study suggests that "sex education before first sex helps protect youth from risky sexual behaviors. For population groups that are often considered the most disadvantaged (i.e. African American females), sex education seems to be the most beneficial" (Mueller et al., 2008, p. 95).

When it comes to the impact of sex education, it seems that timing is important – that how old students are when they receive formal sex education makes a difference in the impact of the program on sexual behaviors. A recent randomized control trial by Erkut, Grossman, Frye, Ceder, Charmaraman, & Tracy (2013) examined the impact of a specific comprehensive sex education program on delaying early sexual initiation. The stated goal of the sex education curriculum used was "to promote sexual health through delaying sexual activity and increasing the correct and consistent use of protection among those who are sexually active" (Erkut et al., 2013, p. 485). For this study, 24 middle schools were randomly assigned to intervention or control conditions after the principal or chief administrator of the school agreed to participate in the study. The authors used baseline and follow-up surveys to measure sexual behavior. The intervention group was compared to the control group in which students received sex education as usual, rather than the specific comprehensive curriculum being evaluated by the study. Study results suggest that the comprehensive curriculum used as the intervention reduced the likelihood of sexual initiation in seventh grade for those sixth graders who received the treatment by 30% -- an effect size similar to that found in other studies of comprehensive sex education programs (see Coyle, Kirby, Marín, Gómez, & Gregorich, 2004; Tortolero et al., 2010). Given the research

design used by Erkut et al (2013) – randomized control trial – this study presents strong evidence that comprehensive sex education does reduce early sexual initiation when taught to younger adolescents. This study is also particularly relevant to review for this project because Erkut et al (2013) examined the role of family structure in relationship to adolescent sexual activity. While previous work suggests that living with two parents is a protective factor against being sexually active (Abma, Martinez, Mosher, & Dawson, 2004), Erkut et al (2013) found that adding two-parent family structure as a predictor variable did not have a statistically significant effect. For this project, examining the effect of Iowa's state-level policy change in sex education, it is important to consider whether family structure should be included in the statistical model. If family structure is a protective factor at the individual level, how might that transfer at the aggregate level? Erkut et al (2013), having used randomization, demonstrate that this likely not a significant factor in sexual health behavior outcomes in combination with comprehensive sex education.

Another randomized control trial using middle schools was conducted by Markham, Tortolero, Flescher Peskin, Shegog, Thiel, Baumler, Addy, Escobar-Chaves, Reininger, & Robin (2012). Much like Erkut et al's (2013) study, the authors randomized at the school level and used just over 1200 participants. This RCT assessed the impact of a risk avoidance program that met the federal standards for abstinence education (abstinence-only), in comparison to a risk reduction program that emphasized abstinence, but also incorporated a computer-based condom skills training component (abstinence-plus). Markham et al (2012) report that the risk avoidance program (abstinence-only) actually increased the number of recent vaginal sex partners reported by participants, but that the risk reduction program (abstinence-plus) delayed any type of sexual initiation among females and African Americans and additionally reduced unprotected sex at last

intercourse reported by participants. This study, similar to Erkut et al's (2013), found that sex education that includes contraceptive information and skills training, when implemented in middle school, positively impacts students by delaying sexual initiation and by reducing sexual risk behaviors among those who are already sexually experienced (Markham et al., 2012).

In his recent systematic review of the literature on the impact of various types of sex education on sexual behavior outcomes, Kirby (2008) found that most abstinence programs did not delay sexual initiation, and only one-third had any positive effect on sexual risk-taking behaviors. In contrast to this, Kirby's (2008) review discovered that two-thirds of comprehensive sex education programs delay sexual initiation and increase condom and other contraceptive use.

These findings are further substantiated by an epidemiologic evaluation of sex education programs by Kohler, Manhart, & Lafferty (2008). Their study used participants of Cycle 6 of the National Survey of Family Growth conducted in 2002, constricting their sample to never-married heterosexual adolescents between the ages of 15-19 years (Kohler et al., 2008). The authors used weighted multivariate logistic regression to generate population-based estimates, allowing them to compare the association of various types of sex education with sexual risk behaviors at the population level. Kohler et al (2008) found that those adolescents who received comprehensive sex education were statistically significantly less likely to report a teen pregnancy, compared to those that received no formal sex education or abstinence-only education. Interestingly, their comparisons showed that while abstinence-only sex education did not reduce the likelihood that adolescents engaged in vaginal intercourse, comprehensive sex education was found to reduce the likelihood of reporting having engaged in vaginal intercourse (Kohler et al., 2008). This is an important finding, as many opponents of comprehensive sex education believe that exposing students to information about contraception will encourage them to initiate vaginal intercourse

because sex education does not provide necessary training to resist sexual initiation and yet provides the information to prevent an unwanted pregnancy. Kohler et al's (2008) findings suggest just the opposite – that adolescents who received comprehensive sex education were less likely to initiate vaginal intercourse.

Further, evidence from a recent meta-analysis supports the hypothesis that comprehensive sex education does little to encourage or increase sexual initiation. Johnson, Scott-Sheldon, Huedo-Medina, & Carey (2011) conducted a meta-analysis of studies that investigated behavior interventions advocating sexual risk reduction for HIV prevention and STI transmission. Johnson et al (2011) analyzed data from 98 interventions, derived from a total of 67 studies, resulting in 51,240 participants total in the meta-analysis. To meet their criteria for inclusion in the meta-analysis, each study had to, among other criteria, use either a randomized control trial or quasi-experimental research design, sample adolescents, and provide information necessary to calculate effect sizes (Johnson et al., 2011)

The major finding of their meta-analysis was that "behavioral interventions reduce adolescents' risk for STIs more broadly, increase condom use, reduce or delay the frequency of penetrative sex, and increase skills to negotiate safer sex and to acquire condoms" (Johnson et al., 2011, p. 81). However, in addition to this finding, the authors also highlight important factors about the implementation of sex education programs as well as important (and surprisingly unimportant) predictive variables. Johnson et al (2011) describe a pattern of intervention characteristics that seem to be the most successful at reducing sexual risk behaviors: "(1) they were implemented with adolescents who were institutionalized, (2) had no focus on abstinence as a goal, (3) had greater numbers of intervention sessions, and (4) had control conditions with non-

HIV content (eg, general health promotion)" (p. 80). The authors note that the following moderating variables were not statistically significant, even on a bivariate basis:

> (1) amount of interpersonal skills training,
> (2) geographic region of the study,
> (3) city size
> (4) racial composition,
> (5) gender composition,
> (6) use of same-gender groups,
> (7) mean age of sample,
> (8) provision of condoms,
> (9) success at increasing use of condoms (i.e., the averaged condom use ES),
> (10) interactions of sessions with intervention content variables,
> (11) study quality score, and
> (12) length of time elapsing following the intervention, which varied from 0 weeks (for long-duration interventions) to 156 weeks (Johnson et al., 2011, p. 80).

Some of the variables that proved to be statistically insignificant in the meta-analysis are important to this project. Specifically, it is useful to know that geographic region and city size did not affect findings. It is also interesting to know that in the meta-analysis, neither gender nor race were significant to the impact of sex education. Still, Johnson et al's (2011) findings suggest strongly that interventions were not successful when they focused on abstinence, whereas comprehensive interventions were successful at changing sexual risk behaviors. Their findings suggest that my exploration of the impact of Iowa's policy change may *not* show heterogeneous effects by race or gender. However, the fact that geographic region and city size did not have a significant impact suggests that even if the synthetic model of Iowa is not absolutely a perfect match, it should not be biased due to differences of geography between Iowa and the donor pool states from which the synthetic model will be created.

A recent systematic review of the evidence on comprehensive and abstinence-only sex education was conducted by Chin, Sipe, Elder, Mercer, Chattopaday . They identified 66 studies of comprehensive risk reduction and 23 studies of abstinence education, from which they

synthesized the current scientific evidence on the effectiveness of these two strategies towards sex education (Chin et al., 2012). The authors conducted meta-analyses on both types of interventions, examining the following seven key outcomes: current sexual activity; frequency of sexual activity; number of sex partners; frequency of unprotected sex; use of either condoms or hormonal contraception; pregnancy; and STIs (Chin et al., 2012). The results of the meta-analyses indicate that comprehensive sex education has favorable effects for all of the outcomes measured, while abstinence education showed no positive effect (Chin et al., 2012). The lack of findings for abstinence education could be due to the ineffectiveness of the programs, but it could also be due to a low number of rigorous studies to include in the meta-analysis and inconsistent findings across the studies, leading to great uncertainty around effect sizes (Chin et al., 2012).

The Achievement Gap and Teenage Pregnancy

Research regarding the social and economic outcomes for teenage mothers suggests that they are less likely to complete their education, more likely to have large families, and less likely to earn high wages (Hoffman & Maynard, 2008; Horwitz, Klerman, Kuo, & Jekel, 1991). Early fertility is not only associated with negative education and labor market outcomes, but it is also associated with intergenerational effects as children of teenage mothers are less likely to receive good prenatal care. This, along with other social and economic disadvantages that come with having a teenage parent, disadvantages these children further (Ali & Dwyer, 2011; Trussell, 1988). The causality of this relationship has been questioned (see Geronimus & Korenman, 1992), yet the correlational relationship is generally accepted and has been further substantiated through a comprehensive literature review conducted by the National Research Council (S. Hofferth & Hayes, 1987). According to the Centers for Disease Control and Prevention, while

90% of female adolescents who do not give birth during high school obtain a high school diploma, only around 50% of female adolescents who gave birth obtain a high school diploma by age 22 (Office of Surveillance, Epidemiology and Laboratory Services, 2011). This suggests that early childbearing has an impact on high school completion.

One known challenge to this theory of action is that fertility rates and educational achievement are likely endogenous, and that both vary by race. Klepinger, Lundberg, and Plotnick (1995) take on this challenge, controlling for numerous personal and community characteristics to examine the relationship between educational attainment and teenage pregnancy. Using both OLS regression as well as five instrumental variables derived from a probit model of the probability that a young woman had a teenage birth, the authors offer more thorough insight into the effects of teen motherhood on educational attainment. Their analysis revealed that among both Blacks and Hispanics, a birth before age 20 had a significant negative effect, reducing educational attainment by nearly three years for both groups. Of note, though, Kelpinger, Lundberg, and Plotnick (1995) take care to point out that an highly important variable omitted from their model is the availability of family planning services – an item that, for high school age or younger adolescents, falls in the purview of public school sex education.

In their study of the role of peer effects in sexual behavior among adolescents Ali & Dwyer (2011) find that a 10% increase in the proportion of an adolescent's close friends who initiate sex increases the probability for that individual to also initiate sex by 5%. Similarly, Ali & Dwyer (2011) find that a 10% increase in the number of sexual partners among an adolescent's close friends raises that adolescent's likelihood of increasing his or her number of sexual partners by 5%. The authors use an instrumental variable model and data from the National Longitudinal Study of Adolescent Health (Add Health) to estimate these peer effects.

However, the peer effects found do not reflect any differences based on the type of formal sex education study participants received. Nor do Ali & Dwyer (2011) address the relationship between the peer effects at work in sexual behavior and peer effects in regards to education attainment.

Reese, Haydon, Herring, & Halpern (2013) also utilize data from Add Health to examine sexual behaviors. They find that sequences of sexual initiation impact the likelihood of a teenager becoming pregnant (Reese et al., 2013). Their multivariate analysis of the Add Health data reveals that when girls initiate sexual activity other than vaginal intercourse, delaying vaginal intercourse initiation for at least one year, they are significantly less likely to become pregnant (Reese et al., 2013). These findings are important as they tell us that the ability of a sex education program to change adolescent behavior in such a way that teenagers delay vaginal intercourse, female students have a much higher chance of avoiding pregnancy before completing high school.

Drop Out Rates

If teenage pregnancy is strongly associated with female students dropping out of high school, it is important to understand the wider context and trends of high school dropouts in the United States. There are wide disparities in the range of the estimated high school drop out rate between various large-scale, national data sets. Heckman and LaFontaine (2010) apply a unified methodology to establish that the true graduation rate is much lower than numbers widely disseminated. They report that based on different data sources, definitions of "high school graduate," and methods used for calculation, the graduation rate in the United States ranges from 66%-88%, and that the range is even wider for minorities: 50%-85% (Heckman & LaFontaine,

2010). Much of the discrepancy in reporting has to do with including students with GEDs in the number of high school graduates (Heckman & LaFontaine, 2010).

Including students who obtain a GED as "high school graduates" is inaccurate due to the ways in which the GED certification interacts with the social and labor markets. While it has been previously believed that students with a GED were equivalent to high school graduates, work by Cameron and Heckman (1991) has proven otherwise. Their work, along with a growing body of subsequent literature, demonstrates that although GED recipients technically have the same measured academic ability as high school graduates, on average they are more similar in economic and social outcomes to similar dropouts who did not pass a GED certifying exam (Boesel, Alsalam, & Smith, 1998; S. V. Cameron & Heckman, 1991; Heckman & LaFontaine, 2006). Therefore, including GED recipients as high school graduates is not an accurate measure of the graduation rate nationally.

While not specifically concerned with sex education, Black et al's (2008) study of the impact of compulsory schooling on teen pregnancy indicates that "policy interventions to increase female education at the lower tail of the educational distribution may be an effective means of reducing rates of teenage childbearing" (2008, p. 1026). This research, revealing the relationship between increasing education and reductions in teenage childbirth, warrants attention because if overall general education has this type of impact, it is plausible to consider that increasing sex education might have a more targeted impact. One challenge to this theory, however, is that it is particularly difficult to track teenage birth rates among Latinas through any public policy because of the number of undocumented Hispanic teenage mothers (Yang & Gaydos, 2010). And yet these adolescents, though often obscured from official data and health services, can and often do attend public schools. That is, while Hispanic teenage mothers may be

undocumented in healthcare data, they may be found in education data. It is precisely because schools take in undocumented children that sex education, within schools, may be the best way to support these students who fall through the cracks of the healthcare system. Because health and education are so deeply entwined, in-school health programs such as sex education offer a promising opportunity to not only improve health but also to strengthen student's educational achievement (Emihovich & Herrington, 1997) as the graduation rates of racial or ethnic minority girls lag substantially behind their counterparts.

There are also known health problems associated with dropping out of high school. These include substance abuse, teenage pregnancy, and psychological, emotional, and behavioral problems (Brindis & Philliber, 1998; Brooks-Gunn, Guo, & Furstenberg Jr, 1993; Freudenberg & Ruglis, 2007). Freudenberg & Ruglis (2007) recommend six different types of interventions that target health issues and may contribute to increasing high school completion rates: (1) mental health programs, (2) substance abuse prevention and treatment programs, (3) sex, HIV, and pregnancy prevention programs, (4) services for pregnant and parenting teens, (5) violence prevention programs, and (6) school climate improvement programs (Table 5, p. 11). Dropout rates have also been linked to increased use of public assistance (Waldfogel, Garfinkel, & Kelly, 2007) and higher rates of crime (Lochner & Moretti, 2001).

Heterogeneous Returns to Education

The economic returns to education refer to the increased potential and real earnings from wage labor with additional, higher levels of education. While in a just society in which race, class or gender did not play a significant role, these returns to education might be stable and equal in among all groups, in fact, returns to education are different. Card (1999) describes the

return to education as "not a single parameter in the population, but rather a random variable that may vary with other characteristics of individuals" (p. 1803).

One example of heterogeneous returns to education can be found at the collegiate level. Those students who are the least likely to obtain a college degree actually benefit the most from having a college degree – a phenomenon known as negative selection. Brand and Xie (2010) provide empirically evidence of negative selection using propensity score matching along with hierarchical linear modeling to examine the effects of completing college on earnings. Additionally, Henderson, Polachek, and Wang (2011) find that on average blacks have higher returns to education than whites, that natives have higher returns to education than immigrants, and that younger workers have higher returns to education than older workers. Overall, it seems that disadvantaged groups experience larger returns to education on average (Brand & Xie, 2010; Card & Krueger, 1991; Henderson et al., 2011; Welch, 1973), meaning that more and better education translates into better labor market outcomes for these groups than privileged groups. The implications of this within the educational policy arena are significant: the typically advantaged student will experience marginal returns to education whereas a disadvantaged student will benefit from increased quality and level of education significantly. Heterogeneous returns to education suggests that improving education disproportionately helps people from traditionally marginalized groups, giving further support for the importance of increasing high school completion rates among racial or ethnic minority students.

High school diploma versus the GED. Estimates by Heckman, Lochner, and Todd (2008) indicate that the internal rate of return to graduating from high school has risen to approximately 50% in the last few decades. This means that the wage returns to completing high school are far higher than the wages of high school dropouts, making completing high school a

high-stakes endeavor. Autor, Katz, and Kearney (2005) reveal that the real wages of high school drop outs has declined steadily since the early 1970s, while the real wages of skilled workers has risen sharply. Additionally, scholars within the U.S. have identified what is known as the "sheepskin effect" – that wage premiums exist for fulfilling the final years of schooling, or rather that it is having the diploma in hand rather than the actual number of years of education that impacts wages (Belman & Heywood, 1991; Card, 1999; Hungerford & Solon, 1987; Kane & Rouse, 1993; Weiss, 1995). This situation makes for great disparity between the wage-potential of a high school dropout, even if they receive a GED, and the wage-potential of a high school graduate. Additionally, the health returns of a GED are substantially lower than the health returns of a high school diploma (Kenkel, Lillard, & Mathios, 2006).

The social justice aspects of this economic situation come to light even more so when considering that minorities disproportionately use the GED program. Of those who complete high school, black males are nearly twice as likely as white males to possesses a GED certificate (S. V. Cameron & Heckman, 1991; Heckman & LaFontaine, 2010). Further, over 10% of all GEDs issued in the United States are now completed in prison (Heckman & LaFontaine, 2010), and prison GED credentials have even lower economic returns than those issued outside of incarceration (Tyler & Kling, 2006).

When GED completers are included in high school graduation rates, the enormous differences in real-wage opportunities are masked. Excluding GED recipients lowers graduation rates for blacks more than for whites, further substantiating the fact that minorities use the GED program much more. This is perhaps one reason why these high school completers experience different returns to education – the value of the GED is substantially lower than that of a high school diploma, and it minorities disproportionately receive the lower value credential.

Cycle of Poverty

In their population-level comparison of abstinence-only to comprehensive sex education programs, Kohler et al (2008) note that exposure to formal sex education varied by socio-economic status among participants. They write, "Like many other health indicators, the opportunity for formal sex education appears to vary by social strata, with disadvantaged youth being the least likely to benefit from formal programs" (Kohler et al., 2008, p. 349). This stratification based on socioeconomic status occurs in many areas of K-12 education. Duncan and Murnane (2011) offer a synthesis of recent scholarship on the growth of income inequality and its impact on education. They identify K-12 education as first area of policy intervention that can improve the life chances of low-income children: "Here we need policies that will help to restore public education's historical role as the key social institution for boosting the lifelong opportunities of poor children" (Duncan & Murnane, 2011, p. 15). Belfield and Levin (2007) share this view that education attainment is critical in determining life chances of employment, income, health status, housing, among other numerous life characteristics. They highlight the importance of reducing educational inequality for social justice: "If life chances depend so heavily on education, then it is important that educational inequalities be redressed in order to equalize opportunities in a democratic society" (Belfield & Levin, 2007, pp. 1–2). However, parental educational attainment remains the strongest predictor of student achievement (Reardon, 2011). So, if a teenage mother drops out of high school, her child's chances of graduating from high school are reduced. In fact, upward educational mobility has decreased significantly since the 1970s, and in recent years downward educational mobility has increased (Hout & Janus, 2011). This means that is far more difficult for a child to exceed her or his parents' education level today than it was in the 1970s. Added to the negative economic consequences are the

education-level predictive power of a teenage mother's dropping out of high school – the odds are heavily stacked against children of teenage mothers who do not complete high school.

As suggested by the title of Maynard's (1996) book – *Kids Having Kids: Economic Costs and Social Consequences of Teen Pregnancy* – it is the general opinion of the public that adolescent girls who become mothers doom their children to poorer life outcomes than if they had waited until reaching adulthood to enter parenthood. This general public opinion is not unsubstantiated as Meade, Kershaw, & Ickovics (2008) reveal through an analysis of the National Longitudinal Survey of Youth. Their research indicates that daughters of teen mothers were 66% more likely to become teen mothers, even after controlling for numerous other risk factors. Because an unmarried teen mother and her child are significantly more likely to live in poverty than older mothers, the theory of action is that the poverty during early childhood experienced by the child increases his or her own likelihood to become early parents (C. C. Basch, 2011; Meade et al., 2008).

The intuitive sense that the early parenting of one generation leads to early parenting in the next is less straightforward in reality. There are, however, some established facts around the association of teen births and educational attainment. For example, teen mothers' education is on average 2 years shorter than women who delay childbearing until age 30 (C. C. Basch, 2011; S. L. Hofferth & Reid, 2002; S. L. Hofferth et al., 2001; Hoffman, 2006). Basch (2011) estimates that teen mothers are 10-12% less likely to complete high school, and that teen mothers are 14-29% less likely to attend college.

While these associations are established, it is less clear whether teen mothers attain less education because they have children, or whether they become mothers because they are not going to attain more education (i.e. already behind or not doing well in school, already dropped

out of school, etc.). Basch (2011) describes the ambiguity around the causal relationship: "There are likely to be reciprocal causal relationships between environments (eg, poverty), education, and health; therefore, some proportion of high school dropouts is attributable to causes other than nonmarital teen births" (2011, p. 616). Levine and Painter (2003) estimate that one half of observed effects of pregnancy on dropout remained after they controlled for environmental factors such as poverty. This means that one half of the effect of pregnancy on high school dropout is attributable to environmental disadvantages such as being in poverty, an unsafe neighborhood, having other members of the family that the mother must care for, etc. These are issues that moderate the relationship of pregnancy on dropping out of school – an adolescent with environmental disadvantages and who becomes pregnant is much more likely to drop out of school.

It is not difficult to imagine which adolescents more often find themselves with "environmental disadvantages." Those girls who become mothers during high school, on average, are poor before becoming pregnant. Given the endogenous relationship between poverty and educational attainment, positing that adolescents perpetuate a "cycle of poverty" by bringing pregnancies to term and entering motherhood early in life is disingenuous. Rather than framing the situation as a cycle of poverty, it is perhaps more fruitful to conceptualize poverty as the state of things in these young girls' lives, and education is thought to be the ladder by which they can climb out of poverty.

However, climbing that ladder proves to be too difficult or seems unattainable to many as Edin and Kefalas (2005) demonstrate in their thorough ethnography of adolescent mothers in poor neighborhoods of Philadelphia. This rigorous ethnography tells us that many girls in poverty do not see teenage motherhood as affecting their eventual labor market participation

much, and therefore see less reason to delay childbearing (Edin & Kefalas, 2005). The dream of graduating from high school, going to college, getting married, and having a baby – in that order – often seems mythical (Dodson, 1999; Edin & Kefalas, 2005). According to Edin & Kefalas' (2005) ethnography, their participants viewed the middle class lifestyle as a distant, unattainable dream – a standard to look to, a goal to strive towards, but with no expectation of ever reaching it. Many do not see a path from education to an improvement in their own economic situation (Edin & Kefalas, 2005). Dodson's (1999) ethnographic study of mothers in poverty reveals a similar theme. She writes, "Universally, the impact of choice, of having more than one way to imagine yourself in the world, is immeasurable" (Dodson, 1999, p. 216). From this perspective, poverty is persistent and unremitting, while a baby can present something to love and a purpose in life (Edin & Kefalas, 2005). The authors summarize the perspectives they learned from the 162 mothers in their ethnography:

> Putting motherhood first makes sense in a social context where the achievements that middle-class youth see as their birthright are little more than pipe dreams: Children offer a tangible source of meaning, while other avenues for gaining social esteem and personal satisfaction appear vague and tenuous (Edin & Kefalas, 2005, p. 49).
> A poor girl who gets pregnant just a year or so sooner than planned reacts far differently than a middle-class girl who gets pregnant a decade or two before she'd intended to (Edin & Kefalas, 2005, p. 47).

These findings hearken back to the issue of heterogeneous returns to education. The young women who find themselves pregnant may not fully understand the different returns to education for a GED rather than a high school diploma. While poor women do seem to know that their chances of completing college and entering a professional career are slim (Edin & Kefalas, 2005), they do not perceive much difference in delaying childbearing by a few years in order to complete high school and having a child a few years earlier than expected and possibly having to complete a GED rather than graduate from high school. This idea is corroborated by Marcotte's

(2013) study of the relationship between high school drop out and teen childbearing. Marcotte (2013) suggests that the causal effect of dropout on birth rates for Black girls may be higher than other groups because of poor employment conditions – that Black adolescents "who upon dropping out find fewer opportunities in the labor market and hence a lower opportunity cost for childbearing" (Marcotte, 2013, p. 264).

The Education Gradient

The existence of a correlation between education and health is well documented and established in scholarly literature. Eide and Showalter (2011) provide a recent systematic review of evidence of the education gradient, as well as a synthesis of the discussion on the effects of education on health along with the reverse – the effects of health on education. They summarize the three explanations for the correlation: (1) higher levels of schooling causes better health, (2) good health causes higher levels of schooling, and (3) both education and health are affected by some omitted factor such as time preferences (Eide & Showalter, 2011). Eide and Showalter (2011) conclude that there is substantial evidence that education affects health, but also that some health aspects such as low birth weight definitely impact education. Adding another wrinkle to the generally accepted knowledge of the education gradient, Zajacova, Rogers, and Johnson-Lawrence (2012) find what they term a "glitch in the gradient." Using over 200,000 individual respondents via the 1997-2010 National Heath Interview Surveys, they find the impact of education on health at the pre-secondary and baccalaureate levels consistent with the broader literature (Zajacova et al., 2012). However, they find that respondents who completed some college but did not obtain a degree as well as respondents who completed vocational associate degrees had worse health outcomes than those high school graduates who never

attended college (Zajacova et al., 2012). This new finding substantiates the theory that there are heterogeneous returns to health just as there are heterogeneous returns to education.

Background and Theory

The education gradient -- the difference in life expectancy between groups of different educational attainment levels (Cutler & Lleras-Muney, 2010). – has been identified and studied for some time. The theories for that explain this association developed from Grossman (1972), who identified health capital as a distinct form of human capital, different from other forms of human capital such as knowledge, and provides an empirical method for estimating the "non-monetary benefits to an investment in education" (p. 244). Grossman (1972) argues that a person's stock of knowledge capital affects his or her market and nonmarket productivity; whereas a person's stock of health capital determines the total *amount of time* he or she can spend producing monetary earnings or commodities [emphasis added]. Grossman (1972) points out that the costs of increasing knowledge capital (i.e. education) are measured by direct costs of formal schooling or on-the-job training as well as the opportunity costs of the time used to increase knowledge capital. Health capital, on the other hand, exhibits a different production function wherein gross investments included individual's own time, market goods such as medical care, diet, exercise, recreation, and housing, as well as environmental factors such as the level of education of the health capital producer, which influences the efficiency of the production process (Grossman, 1972).

By conceptualizing the demand for good health and health as a form of human capital in this way, Grossman (1972) paved the way for the productivity hypothesis – that schooling is an input in the production function of health capital, and that individuals with more schooling can produce more health from a given set of inputs when one of those inputs is education; when

education is increased, the input into the production function rises and more educated individuals are thus enabled to produce more health capital (Amin, Behrman, & Spector, 2013). A corollary to the productivity hypothesis is the allocative efficiency hypothesis that states that "improving schooling improves an individual's *ability* [italics added] to make the best choice of inputs from which health is produced" (Amin et al., 2013, p. 134). Both the productivity hypothesis and the allocative efficiency hypothesis constitute the theoretical foundation for a causal relationship between education and health. However, they suggest very different policy implications, and there is little consensus about the existence and nature of a causal relationship between education and health. That is, the extant literature suggests that while the education gradient is real, scholars are unsure as of yet as to whether it is a causal relationship in one direction or the other, or if schooling and good health are reciprocally causal. However, whether it is through productivity or through allocative efficiency, the fact remains that there is a strong relationship between level of education and health status. In terms of health, what we don't know literally can kill us, and greater educational attainment is a clear indicator towards improved health even if we are unsure by what mechanism this is achieved.

Another theory of the education gradient is resource substitution theory as a case of structural amplification (Mirowsky & Ross, 2003). Resource substitution theory predicts more health benefits from personal education for those individuals whose parents were poorly educated than for those whose parents were well educated (Ross & Mirowsky, 2011). This means that if a person's parents were poorly educated, she can overcome the health disadvantages associated with low parental education through high levels of personal education. However, if a person's parents are poorly educated, and she herself is also poorly educated, the health disadvantages are amplified, making the negative effect of low education levels stronger.

Ross and Mirowsky (2011) test this theory empirically and find that the increased negative impact of poor education on those whose parents were poorly educated come primarily through poor health behaviors, specifically smoking and obesity.

Synthesis of The Education Gradient Literature

One of the earliest attempts to test for direct and indirect effects of education on health was made by Leigh (1983), who examined the effects of health through two mechanisms: healthy habits and choice of occupation. Using evidence from two national surveys, Leigh's (1983) findings suggest that the indirect effects of education on health are stronger than direct affects. The author provides a rudimentary block recursive causal model:

$$HealthyHabits = \int_{1}(+schooling, X) + e_1 \quad (1)$$

$$HazardousJob = \int_{2}(-schooling, Y) + e_2 \quad (2)$$

$$Health = \int_{3}(+Schooling, HealthyHabits, -Hazar\,dousJob, Z) + e_3 \quad (3)$$

Wherein X, Y, and Z are vectors of control variables and e_1-e_3 are normally distributed error terms. This presents the structural form, while the following formula provides the reduced form, showing the combined direct and indirect effects of education on health:

$$Health = \int_{4}+schooling, Z) + e_4 \quad (4)$$

(Leigh, 1983, p. 228). This basic model is highly useful because it allows for the decomposition of the effects of schooling into direct and indirect. The products of the coefficient on schooling from equation (1) and the coefficient on healthy habits from equation (3) provides the indirect effect of schooling on health through the mechanism of schooling improving healthy habits. The product of the schooling coefficient from equation (2) with the hazardous job coefficient from equation (3) shows the indirect effect of health on schooling through years of schooling

influencing choice of occupation. Equation (4) combines all indirect effects (impact on healthy habits and choice of occupation) with direct effects (the coefficient on schooling in equation (3)) (Leigh, 1983). In order to examine the direct and indirect effects of schooling on health Leigh (1983) compares the structural and reduced form health equations. His findings show that the indirect effect of choosing a safer job is approximately 4 times larger than the direct effect of schooling on health. Similarly, he also finds that the indirect effect of developing healthier habits is larger than the direct effect of education on health (Leigh, 1983). Leigh cautions that the block recursive model used for this analysis assumes that causality runs from schooling to healthy habits and safer job choice, and thus indirectly to better health outcomes, an assumption that is supported through logic and theory rather than empirical testing. Nevertheless, his model has formed the basis for most subsequent research into the causality and impact of education on health. While later studies have had the opportunity to deploy more sophisticated econometric methods (i.e. panel data analysis techniques, instrumental variables, and greater capacity to test logit models), most are fundamentally undergirded by the equation series set forth by Leigh (1983). While Grossman's (1972) work constitutes the seminal literature that developed the theories of the education gradient, Leigh's (1983) work represents the seminal scholarship on modeling and examining the causality of the education gradient.

Elo and Preston (1996) extend this work by using data from the National Longitudinal Mortality Survey (NLMS) in order to compare the magnitude of education mortality differentials – mortality being a key measurement in the education gradient – in the United States with those in Europe. They found that reductions in mortality for each additional year of schooling are similar in the United States to those found in European countries (Elo & Preston, 1996). Using logistic regression, the authors determined that for all subgroups, college graduates have lower

mortality than high school graduates and that high school graduates have lower mortality than those who did not complete high school (Elo & Preston, 1996). The authors were surprised, however, to find that race was an important factor in the education gradient. After controlling for region of birth, black males between ages 25-64 showed log odds of dying 58% higher than that of white males in the same age group (Elo & Preston, 1996). They discuss this unexpected finding:

> Although the focus of this paper is educational attainment, we have also uncovered a large mortality differential between blacks and whites at ages 35-64. The large *mortality penalty associated with being black* [emphasis added] has often been obscured by research designs that include experience at ages above 65, where recorded mortality rates for the races appear to converge (Elo & Preston, 1996, p. 56).

This finding is important because it began to uncover racial disparities in quality of health that are associated with educational attainment. Williams and Mohammed (2013) find that social policies that seek to reduce racism by improving educational quality can improve health. Additionally, Walsemann, Gee, and Ro (2013) find that the education gradient is not experienced homogenously. They write, "…the basic relationship between educational attainment and health is not seen equally among all social groups and points to the possibility that the effects of educational attainment intersect with multiple forms of stratification" (Walsemann et al., 2013, p. 1084). This echoes of the feminist concept of intersectionality in which women of color experience oppression not just by race or gender but through matrices of power within society (Collins, 2000; Crenshaw, 1991). That is to say that certain groups experience the world and its social structures through multiple lenses of identity, and that the effects of these experiences through things such as educational attainment and its relative impact on health are affected by an individual's own identity within social power structures.

Other than the significant finding around race, health, and education, the second major contribution of the work done by Elo and Preston (1996) was that they used panel data with logistic regression, offering a tighter analysis of the causal relationship between education and health. However, this was still premised essentially on Leigh's (1983) structural equations that assumed the direction of the causal pathway was from education to health.

Arendt (2005), however, attempts to address the direction of causality using a Danish panel data set, explicitly addressing the possibility of omitted variable bias due to unobserved factors. Arendt (2005) hypothesizes that two missing variables of importance are childhood health (or health endowment prior to educational attainment) and individual preferences for the future. To account for the endogeneity of education, Arendt (2005) uses a panel version of a two-stage conditional maximum likelihood estimator, using two Danish school reforms as instrumental variables. The first reform occurred in 1958, and effectively increased access to additional education for lower class children; the second reform occurred in 1975 and it raised the minimum school-leaving age, thus increasing the number of years of compulsory schooling from 7 to 9 years (Arendt, 2005). The instrumental variables findings suggest that each year of additional schooling improves the probability of an individual having good or very good health approximately by 10% (Arendt, 2005). However, the author points out that the instruments may be weak,[6] meaning that they may introduce bias into the estimates, and based on the strong possibility of weak instruments in this research, the author is unable to conclusively reject the assumption that education is exogenous to self-reported health, but he is also unable to reject the null hypothesis of no effect of education on health (Arendt, 2005). A more recent study by

[6] For full discussion of weak instruments in instrumental variables regression see Card (1999), Hahn and Hausman (2002), and Staiger and Stock (1997).

Braakmann (2011) also uses changes to compulsory schooling laws as an exogenous forcing variable to investigate the relationship between education and health. Braakmann (2011) finds no effect of education on health using compulsory schooling law changes in the UK as an exogenous variable; however, this finding is very limited because the regression discontinuity design only allows for a very narrow sampling framework. Specifically, as Braakmann (2011) describes, "…the income and labour market situation of individuals nudged into completing their CSE qualifications was not better than that of individuals leaving school without any qualifications" (p. 754).

In a very similar study to Arendt's (2005), Albouy and Lequien (2009) use a French longitudinal dataset along with two education reforms to examine whether or not compulsory education laws lower mortality. However, in this study the authors deploy a regression discontinuity design instead of using the education reforms as instrumental variables (Albouy & Lequien, 2009). Each reform raised the minimum school leaving age at different time periods, first to age 14 then to age 16. Much like Arendt (2005), Albouy and Lequien (2009) were unable to conclusively demonstrate a causal relationship between compulsory schooling laws that increase years of education and declines in mortality, though they did establish an association with the increases in compulsory education with lower mortality rates.

Groot and van den Brink (2007) expand the analysis of the impact of education on health, examining not only the health returns to education but also the economic returns to education via health. They ground their analysis in the theory that economic values for education and health as human capital are found in the effects both have on productivity, making their study one under the umbrella of productivity theory begun by Grossman (1972). Groot and van den Brink (2007) use a large-scale survey from the Netherlands – the 1999 Supplementary Provision Surveys

(SPS) of the Dutch Social and Cultural Planning Bureau, a random national cross-sectional survey conducted every four years. The authors use probit equations on dummy variables for the prevalence of certain diseases and handicaps, along with multivariate analyses to convert education level into years of education (Groot & Maassen van den Brink, 2007). Based on the assumption that latent quality of health is determined by educational attainment, the years of education of both parents, the prevalence of diseases and handicaps and other individual characteristics, they model latent quality of health such that:

$$H^{*}=\beta_0+\beta_1 S_r+\beta_2 S_p+\beta_3 S_m+H^{0}\beta_4+X\beta_5+\varepsilon$$

where S_r is the number of years of education of the participant, S_p and S_m are the number of years of education of the participant's father and mother, X is a vector of individual characteristics, all β's are vectors of coefficients, and ε is a normally distributed error term that includes unmeasured effects on the true health status of the participant (Groot & Maassen van den Brink, 2007, p. 192).

Their analysis revealed that for both women and men, higher educated people were in better health than lower educated people; however, the effect of education on health is larger for men than for women (Groot & Maassen van den Brink, 2007). They estimate that one year of education improves the state of health for men by 0.6% and for women by 0.3% (Groot & Maassen van den Brink, 2007, p. 194). These gender differences are also reflected in the analysis by the significance of the effect of parents' education on an individual's health. The authors found that only years of education of the mother showed a statistically significant impact on the quality of health of daughters; the father's education did not (Groot & Maassen van den Brink, 2007). Further, while the mother's education did impact women's health, it did not show a statistically significant impact on men's health (Groot & Maassen van den Brink, 2007). This is

quite interesting, as there appear to be not only gender differences in the impact of education on health, but there also appear to be gender differences in the intergenerational transfer of health quality as well.

Similarly, Price, Price, and Simon (2011) document gaps in outcomes for individuals by education of the mother. These finding will be important later on when constructing the model; if it is possible to decompose parental education level by gender, this study suggests that doing so will offer deeper insight into the mechanisms behind the relationship between education and health. Other authors find heterogeneous effects of education on health by gender as well. For example, Mazzonna (2014) shows evidence of gender heterogeneity on memory, self-rated health, and depression for men only, but also suggests that the data point to a low labor force attachment among women, and that this is related to the heterogeneity in returns to education on health. Similarly, using longitudinal data on Australian twins, Webbink, Martin, and Visscher (2010) find that education reduces the probability of being overweight within male twin groups, but not within female twin groups; that is, identical twin sisters who differ in educational attainment do not systematically differ in body size. In contradiction to this finding, Amin, Behrman, and Spector (2013), using data on U.K. twins, find some evidence that more schooling reduces body mass index for women, even after controlling for unobserved health endowments. While these twin studies provide conflicting information, they also provide further evidence of heterogeneity in the education gradient, which is important as we begin to examine the differential impacts of health policies within schools, and the implications they may have for different subgroups.

Groot and van den Brink (2007) contribute to our understanding of the education gradient lastly by first establishing that a causal connection between education and health cannot be

rejected. They then offer insight into the magnitude of the effect by converting the health benefits of education to a monetary metric. Calculating the implied health returns to education at the average value of GDP per capita, Groot and van den Brink (2007) estimate that the health returns to education are 1.3-5.8%. They again find gender differences in their analysis – the value of health gain due to one year of education as a percentage of GDP per capita is 2.5%-5.8% for men, but only 1.3%-2.8% for women (Groot & Maassen van den Brink, 2007, p. 198). Despite this disparity, the authors conclude that the health benefits seem to be larger than the costs of a year of education for both men and women (Groot & Maassen van den Brink, 2007).

One of the most important studies of the education gradient was conducted by Cutler and Lleras-Muney (2010), in which they utilize a variety of datasets from both the United States and the UK in order to parse out different explanatory factors of the relationship between education and health. The authors' analyses suggest that income, health insurance, and family background account for about 30 percent of the education gradient, while knowledge measures of cognitive ability account for an additional 30 percent (Cutler & Lleras-Muney, 2010). They find that a significant portion of the effect of education is associated with general cognitive ability, and theorize that this mechanism works such that education raises cognitive ability, which then in turn improves health behaviors (Cutler & Lleras-Muney, 2010). Their study does not attempt to make a causal claim about the education gradient, but instead seeks to parse out differing explanations for it. They find that each year of schooling is associated with a 3.0 percentage point lower probability of smoking, and that every year of education lowers mortality risk by about 24 percent through the reduction of risky behaviors such as drinking, smoking, and being overweight (Cutler & Lleras-Muney, 2010, p. 3). The authors find that, even after controlling for income, education has a significant impact on smoking and obesity (Cutler & Lleras-Muney,

2010). Of particular significance, the authors find that cognition accounts for a significant portion of the impact of education on health. They write,

> Causality is a central issue in this debate. It may be that education leads to greater intelligence (by this we mean better decision making abilities), and that intelligence matters for outcomes – we term this the learning channel. An equally plausible hypothesis is that people who are more intelligent go on to more education, and education matters for outcomes. Alternatively, there may be some third factor that influences both education and cognitive ability and also determines health behaviors (Cutler & Lleras-Muney, 2010, p. 22).

Using measures of cognition from different points in time, they determine that education leads to healthy behaviors by comparing cognitive ability in early childhood with measure of cognition in late childhood. Their results suggest that "what is learned from age 7 to 11, and then from age 11 to 16 accounts for a significant portion of the education gradient" (Cutler & Lleras-Muney, 2010, p. 22). Cutler and Lleras-Muney's (2010) work suggests that at least one third of the education gradient is due to education itself, and further that education during late childhood through early adolescence has the largest impact. This is important when examining whether or not comprehensive sex education could impact the education gradient, as it is precisely during the years of greatest effect of education on health that sex education is implemented.

Recently, Conti and Hansman (2013) have argued that Cutler and Lleras-Muney's (2010) findings are not robust to the role of personality traits. They first replicate the findings of Cutler and Lleras-Muney (2010), and then use alternative measures of non-cognitive skills to conduct the same analysis (Conti & Hansman, 2013). They add two additional sets of non-cognitive behavior measures, and upon doing so find that personality contributes nearly as much to the education gradient as cognitive ability (Conti & Hansman, 2013). However, Conti and Hansman (2013) fail to examine the role of education in contribution to personality traits, whereas Cutler

and Lleras-Muney (2010) were able to demonstrate that increased years of education impacted cognitive ability and thus impacts health.

Whole-child Reform Movements

When considering the juncture of health policy and educational outcomes, it is important to examine other types of school reforms that follow a similar logic: that it is necessary to improve health in order to improve education. Types of school reforms that have been in use that align with this paradigm are considered "whole-child" approaches. Some examples of these include the Harlem Children's Zone and the Broader, Bolder Initiative. These and other "whole-child" approaches to school reform and improving educational outcomes for students often deploy a strategy for educating children that involves wrap-around services that include health services for students as well as parents, and even programs that seek to improve entire neighborhoods. This section provides a brief overview of the major whole-child school reform efforts in the United States along with existing empirical reviews of their efficacy. An examination of these programs yields insight into the cost-benefit relationship of sex education as an intervention to improve education, as well as the potential efficacy in comparison to other holistic approaches to education reform.

In a recent presidential address to the Association for Public Policy and Management (APPAM), education policy scholar Helen Ladd (2012)suggested that "it would be difficult, if not impossible, for the United States to replicate the success of higher scoring countries such as Finland, Canada, and the Netherlands by focusing on school reform alone, and that is especially true for school reform that pays little attention to meeting the social needs of disadvantaged children" (p. 211). Ladd (2012) surmises that the root cause of the dismally lower scores of the United States on international tests in comparison to high scoring countries lies in the fact that

this country does not address the environmental factors that contribute to persistent educational inequality. Ladd (2012) conceptualizes the following functional relationship for educational outcomes: $EducationalOutcomes = f(PublicSchoolQuality, Context)$ (p.211), highlighting the fact that education policymakers have substantial control over school quality, they have less control over context, and thus are very limited in their ability to impact educational outcomes. Ladd (2012) points out that denying the strong empirical evidence of a correlation between low SES and education outcomes has undergirded most school improvement reforms. Concepts such as NCLB and "no excuses" models of schooling do not let schools off the hook simply because they serve large populations of low SES students. A positive understanding of this perspective is that educators must not succumb to the "soft bigotry of low expectations." However, as Ladd (2012) argues, this paradigm ignores the very real and powerful impact of SES and family background on educational outcomes. To ignore it, even with the best intentions, is simply bad science.

In order to more fully address the function that brings about school outcomes ($EducationalOutcomes = f(PublicSchoolQuality, Context)$, Ladd (2012) recommends a number of logical policy directions including developing school-based health clinics. Modeled after practices in Finland, Ladd suggests policymakers utilize school-based health clinics to provide "routine and preventative care, provide services to children with acute health problems in a timely manner, monitor children's health in a systematic way as they progress through school, and [can] address basic dental and vision problems that might otherwise impede children's learning" (p. 221). While this type of intervention in schools is routine in Finland, the is no evidence that such a model would work, either functionally to provide health services or to improve education outcomes, in the United States.

Ladd's (2012) suggested policy directions are unsurprising in light of a comprehensive literature review by Basch (2011) that identified, synthesized, and prioritized educationally relevant health disparities that have potential to help close the achievement gap. Basch (2011) applied three criteria to establish priorities for health interventions that may help reduce the achievement gap: (1) the prevalence of health disparities among at-risk groups, (2) scholarly evidence of a causal effect on educational outcomes, and (3) the feasibility of implementing school-based programs. Based on these criteria, Basch (2011) provides a list of seven priority health targest: (1) vision, (2) asthma, (3) teen pregnancy, (4) aggression and violence, (5) physical activity, (6) breakfast, and (7) inattention and hyperactivity. Of note here is that teen pregnancy ranks third in the list of the most important and promising health interventions to improve educational outcomes, offering more support for the importance of studying the effects of comprehensive sex education.

Like other supporters of health interventions in schools, Basch (2011) makes his argument for in-school health programs by way of the physical geography of students, writing:

> …with more than 50 million students spending a significant portion of their daily lives in school, this social context is surely one of the most powerful social institutions shaping the next generation of youth. By systematically addressing educationally relevant health disparities, schools can reduce both educational and health disparities (p. 594).

The School-Based Health Alliance, an organization dedicated to increasing health clinics available in schools, simply states, "The school setting is a sensible and appropriate place to deliver health care because *that is where the students are* [emphasis added]" ("About School-Based Health Alliance - School-Based Health Alliance," n.d.).

Keeping in mind the importance of context and the whole-child, the Broader, Bolder Approach to Education (BBA) lists increasing investments in health services as a key component

of its mission (Ladd, Noguera, & Payzant, 2014). BBA concludes its mission statement with a clear policy directive: "We believe that it is both possible and necessary to weaken the link between social and economic disadvantage and low student achievement. A policy strategy that combines continued school reform with efforts to address the roots of low achievement can be effective in doing so" (Ladd et al., 2014, p. 3). The BBA paradigm provides a more holistic strategy to school reform that does not ignore the effects of poverty on children's performance in schools, and theoretically provides a way for disadvantaged youth to break out of the cycle of poverty (Noguera, 2011).

However, as with many policy initiatives, scholars are unclear about which elements of poverty are best overcome through school or community improvements. Further, even when reform initiatives work in certain areas, there are no guarantees that the same reforms will yield the same results in different locations. Levin (2013) provides an analysis of the barriers to scaling up some of the most well-known and most successful school reforms. The Harlem Children's Zone provides children and families in a defined geographic area with comprehensive education and social services ("Harlem Children's Zone," 2014; Levin, 2013). However, replicating the program would require an estimated additional $5,000 per student per year, and because each community is different, integrating services to work efficiently would be a substantial challenge (Levin, 2013).

The Harlem Children's Zone (HCZ) presents an interesting case study of the ways in which more holistic approaches to school reform work. HCZ provides an array of services, some of which are primarily school-based while others are primarily community-based ("Harlem Children's Zone," 2014). Dobbie and Fryer (2009) provided the first empirical analysis of the efficacy of the Harlem Children's Zone on improving education outcomes for

children. They use charter lottery enrollment processes and other instrumental variable strategies to test the causal impact of HCZ on education, finding conclusively that the program is effective at increasing the achievement of poor, racial or ethnic minority children in Harlem (Dobbie & Fryer Jr, 2009). The Harlem Children's Zone began in 1970 as a combination of after-school programs, truancy-preventions services, and anti-violence training for teenagers in schools. It was after the disintegration of central Harlem during the 1980s that the program, then called the Rheedlen Centers for Children and Families, began to question their piecemeal strategy and to instead build an integrated, comprehensive program to serve a 24-block area in central Harlem (the program subsequently expanded to a 64-block area in 2004 and a 97-block area in 2007) (Dobbie & Fryer Jr, 2009). The vision of the newly restructured program was "to 'create a tipping point' in the neighborhood so that children are surrounded by an enriching environment of college-oriented peers and supportive adults (Dobbie & Fryer Jr, 2009, p. 5). Dobbie and Fryer (2009) sort out the array of services provided by HCZ to test the impact of school-based investments versus community investments. They found that it was primarily school investments driving the improved student outcomes, not the additional community supports provided by HCZ (Dobbie & Fryer Jr, 2009). This is unsurprising because the impetus behind the formation of the HCZ was the lack of test-score growth under the community-only model previously used by the Rheedlen Centers for Children and Families (Dobbie & Fryer Jr, 2009).

The fact that it was school-based improvements rather than community improvements that led to increased student achievement in Harlem is also unsurprising in light of the Moving to Opportunity (MTO) experiment -- a major randomized housing mobility experiment sponsored by the U.S. Department of Housing and Urban Development. This program relocated

individuals from high-poverty to low-poverty neighborhoods while roughly holding constant the quality of schools ("MTOresearch.org," n.d.). The geographic relocation to low-poverty neighborhoods, along with the randomized control trial design of the research, allowed researchers to change environmental factors in isolation to examine impacts on education (Kling, Liebman, & Katz, 2007; Sanbonmatsu, Kling, Duncan, & Brooks-Gunn, 2006). MTO demonstrated null results for girls and negative results for boys (Kling et al., 2007; Sanbonmatsu et al., 2006). Based on this research and Dobbie and Fryer's (2009) analysis of the Harlem Children's Zone, it seems that it is school improvements that make a difference to student achievement, above and beyond community improvements. This is particularly interesting in the case of HCZ because Dobbie and Fryer (2009) sorted programs into two categories: school investments and community investments, yet within the school investments, they list a health clinic that opened inside the HCZ Promise Academy 1 middle-school building. The school-based health clinic provides free medical, dental, and mental-health services, and also works with the elementary schools to identify children's unmet health needs early (Dobbie & Fryer Jr, 2009).

In their later analysis of effective charter schools in New York, Dobbie and Fryer (2011) examine the role of wrap-around services in meeting the needs of the "whole child." Their analysis suggests that there is not a statistically significant relationship between wrap-around services and school effectiveness (Dobbie & Fryer Jr, 2011). This is not to say that "whole-child" approaches are ineffective, but rather to highlight that it is when health and social-emotional supports are located within the school structure that they impact achievement, rather than as add-on, or "wrap-around" programs. Payton et al's (2008) meta-analysis shows that school-wide social-emotional learning programs increase achievement on average by one quarter of a standard deviation, and by close to half a standard deviation when those programs target at-

risk groups. It is also important to remember that caring approaches to education, very akin to the whole-child movement, have long been supported by feminists (Noddings, 2013).

Lastly, whole-child reform movements that *do* place services inside of schools face organizational challenges. In their study and evaluation of school-based health clinics in Florida, Emihovich and Herrington (1997) found that the effectiveness of school clinics had much to do with how well established it was and to what degree the program encountered organizational challenges. Their ethnographic study of specific health clinics in Florida uncovered intergovernmental issues, inter-professional and turf issues, political and ideological conflicts, and "the particular problems of asking principals of schools to relinquish some of their authority over what goes on in "their" school" (Emihovich & Herrington, 1997, p. viii). This study suggests that broad health interventions within schools are challenged by the daunting task of integrating previously independent services in addition to political challenges whereby opponents do not see schools as an appropriate site for such services.

Taken together, the findings around whole-child school reform suggest that they are most efficacious when situated within schools rather than as community services. However, situating health services within schools is a challenging endeavor. Yet, interventions that are less comprehensive than in-school health clinics (such as dental and vision screenings and sex education), present a more feasible route to fulfilling the goals of whole-child school reform.

CHAPTER 3: METHODOLOGY

Research Design

This project is designed to estimate the causal impact of a policy change to sex education to make it comprehensive on educational and health outcomes. The extant literature has demonstrated some evidence that comprehensive sex education reduces sexual risk taking, STDs, and unintentional pregnancy better than abstinence-only sex education. Additionally, the extant literature has established the existence of a strong correlation between health and education, and likely a causal relationship between health improvements and educational achievement and health outcomes. The purpose of this project, therefore, is to examine the causal connection between sex education and educational outcomes in addition to health outcomes. With secondary data, I use the synthetic control method to statistically derive a synthetic comparison state in order to estimate the causal impact of Iowa's policy change to sex education.

Causality in social science research is notoriously difficult to determine due to the problems often associated with implementing randomized control trials (RCTs). RCTs are costly and in social policy often present ethical and political dilemmas over random assignment. That is, even if one could, with enough funding, randomize children to an educational intervention, that does not mean one *should*. Additionally, threats to internal validity abound in educational research; spillover effects can occur when teachers, parents, or students talk to one another about interventions; attrition inevitably occurs with base levels of student movement into and out of schools that may or may not be assigned to treatment; and pressure from parents for their child to be selected into treatment increases if the treatment is perceived as beneficial. These can all

undermine the feasibility of meeting the necessary assumptions of an RCT, and because of these problems with social science experiments, it is increasingly important to utilize quasi-experimental research to derive causal relationships (Shadish, Cook, & Campbell, 2001). Though a true, randomized control group that matches the treatment group is preferable, it is possible, using counterfactual reasoning, to come close to a control group that mimics the properties and trends of a true, randomized control group.

The synthetic control method allows researchers to achieve such a counterfactual that mimics the control group. This method was developed and demonstrated by Abadie et al (2010). In this study, the researchers used the synthetic control method to test if California's Proposition 99[7] reduced state-level smoking. Instead of comparing California to another state or set of states based on geography or other theoretical factors, the authors demonstrated the utility of creating a numerically derived synthetic control unit based on observable, pre-treatment characteristics from a pool of possible comparison states. By measuring pre-treatment, observable characteristics, the authors created a "synthetic California," or a counterfactual California – a comparison unit that did not adopt Proposition 99, effectively allowing the researchers to compare outcomes in California to the outcomes of "synthetic California" had it not adopted the policy. Using the synthetic control method is quite useful in research designs wherein the researcher cannot produce the conditions necessary for a true experiment, research such as this project where the investigator has no control over whether or not students receive comprehensive

---

[7] Proposition 99 was also known as the *Tobacco Tax and Health Protection Act*, and was enacted in 1988. It imposed a 25-cent per pack state excise tax on the sale of tobacco cigarettes within California, with approximately equivalent excise taxes similarly imposed on the retail sale of other commercial tobacco products. Proposition 99 also placed restrictions on the sale of tobacco include a ban on cigarette vending machines in public areas accessible by juveniles, and a ban on the individual sale of single cigarettes (California Department of Public Health, 2014).

sex education. It is also a particularly good methodological choice in situations where only one state (or very few states) experienced the same policy change. In the case of sex education, Iowa was the only state that changed its policy from abstinence-only to fully comprehensive sex education, though several other states did change from abstinence-only to abstinence-plus sex education during the same time period. Those states will be excluded from the analysis.

For comparative case studies, "an additional source of uncertainty derives from ignorance about the ability of the control group to reproduce the counterfactual of how the treated unit would have evolved in the absence of the treatment" (Abadie et al., 2010a, p. 10). Since it is impossible to go back in time and take back the sex education instruction and measure those students' outcomes, the synthetic control method is a way to compare state-level student outcomes to a counterfactual in order to draw causal inferences about the impact of the intervention. This is true if data are aggregated or individual – a theorized control group presents uncertainty about how well the control matches the counterfactual treated group, or, the treated group had they not undergone treatment. The synthetic control method is similar to propensity score matching in the use of observable characteristics from possible comparison units. The synthetic control method is appropriate when there is one treatment group and several potential control groups, as is the case here because Iowa was the only state that made a complete change to comprehensive sex education. While quasi-experimental designs have been criticized for their ability to truly mimic randomization (LaLonde, 1986), propensity score matching has been shown to perform quite well in this manner (Dehejia & Wahba, 1999), a methodological characteristic that bodes well for synthetic controls as the aggregate data "version" of propensity score matching.

In causal inquiry, it is of great importance to clearly map out the hypothesized causal pathways. Pearl's (2009) graphical notation helps to think through possible causal relationships without the constraint of linear or nonlinear form. Graphs consist of a set of V *vertices* (also known as nodes) and a set *E* of *edges* (also known as links), where V variables are connected by certain relationships as denoted by the ends and format of E *edges* (Pearl, 2009). Every edge in a graph can be directed (a single arrowhead on the line), undirected (no marks on the line), or bi-directed (arrowheads on both ends of the line, represents confounders) (Pearl, 2009). These graphs may include directed cycles that represent feedback loops; an example might be X→Y,Y→X (Pearl, 2009). If a graph contains no directed cycles, it is called *acyclic*, whereas a graph that is both directed and acyclic is called a *directed acyclic graph* (DAG) (Pearl, 2009). Using this functional form, DAGs particularly allow researchers to conceptualize potential causes and confounders. Pearl's (2009) d-separation criteria is useful to test the independence of X and Y, given Z theoretically by examining if the nodes corresponding to variables Z "block" all paths from nodes in X to nodes in Y. Paths are the sequence of consecutive edges, of any directionality, in the graph, and blocking means controlling for or stopping the dependency between the variables (Pearl, 2009). In sum, constructing, and then deconstructing, a DAG helps assure that causal pathways have been found and that the concept of *ceteris paribus* has been met.

Utilizing Pearl's (2009) graphical language, Morgan and Winship (2007) provide further understanding of the role of counterfactuals and causal graphs in causal research. Morgan and Winship (2007) offer three basic strategies for estimating causal effects: (1) condition on (eg, control for) variables in order to block all back-door paths from the causal variable to the outcome variable; (2) use exogenous variation from an appropriate instrumental variable in order

to isolate covariation in the causal and outcome variables; and (3) establish an "isolated and exhaustive mechanism that relates the causal variable to the outcome variable and then calculate the causal effect as it propagates through the mechanism (p. 26). Furthermore, Morgan and Winship also describe three basic patterns of causal relationships: (1) a chain of mediation, (2) a fork of mutual dependence, and (3) an inverted fork of mutual causation. The diagram provided in Figure 3 is adapted from Morgan and Winship (2009, p.65) with additional explanations added to translate Pearl's (2009) language of causality into terms more traditionally used in social science statistics. Based on the work of Morgan & Winship (2007), Rubin (1974), and Pearl (2000), the diagram shown in Figure 4 demonstrates the pathways I hypothesize.

The policy change to comprehensive sex education is the independent variable for each type of outcome: educational and health. However, determining causality between comprehensive sex education and these outcomes is complicated by the relationship between education and health (the arrow goes in both directions). Each filled circle denotes an observed variable, while each unfilled circle represents unobserved variables. The dashed edges represent direct relationships, or the reduced form of the impact of comprehensive sex education on the outcome variables.

Accounting for unobservable characteristics throughout the causal pathway is greatly important to obtaining an unbiased estimate. The synthetic control method helps with this as the unit, whether it is school-level, district-level, or state -level data, is compared to its counterfactual self,. The synthetic control is derived only from observable characteristics that are not included in the causal pathway in the post-treatment time period. Because the synthetic control method is an extension of the difference-in-differences approach, it is necessary to address the assumption of parallel trends in the pre-treatment time period necessary to obtain an

unbiased DD estimate. However, after establishing the necessary assumptions are met, the observables in the causal pathway from the post-treatment time period would not be used for weighting the synthetic control.

Again, drawing from the difference-in-differences approach using panel data, the method allows the choice of using fixed-effects to further account for unobservable characteristics. Using a difference-in-differences approach, we compare the treated group with another group that did not receive treatment -- in this case a policy change around sex education -- thought of as a control. The basic difference-in-difference linear model given by:

Equation 1

$$Y_{gt} = \alpha + \gamma Post_t + \delta Treat_g + \beta(Post_t * Treat_g) + \varepsilon_{gt}$$

where *g* represents group (state), and *t* represents time (year in relation to treatment). The interaction term $Post_t * Treat_g$ yields the estimate of the treatment effect. The DD estimator gives the difference in the average outcome in the treatment group before and after treatment, minus the difference in the average outcome in the control group before an after treatment.[8] A synthetic control method draws from this model, except that the control group is the synthetically created control, using a weighted average of available control units. However, the outcomes are still differenced pre- and post- policy to determine the effect of the policy. The synthetic control model extends difference-in-differences by allowing the effects of unobservables on the outcome of interest to vary with time (Abadie et al., 2010a). That is, unobservable characteristics can be accounted for through a fixed-effect, but this takes away a great deal of the between-state variance. The synthetic control model, because it creates a control unit that is statistically derived

[8] $\widehat{\delta_{DD}} = (\bar{Y}_1^T - \bar{Y}_0^T) - (\bar{Y}_1^C - \bar{Y}_0^C)$

from the *group* of potential control states, allows unobservable characteristics to remain in the model because they are modeled in the synthetic control unit.

To motivate the synthetic control model, we need J+1 units in periods 1 to T, where only 1 unit receives treatment during time period T_0 to T, leaving J units as possible controls. The model necessitates the assumption of no relationship between units, and that the outcomes of the untreated, potential control units, are unaffected by the treatment on the treated units. The potential control units J are weighted based on observable, pre-treatment characteristics. The weight of these characteristics can be made to sum to 1, creating, based on the matched characteristics, an ideal control unit that is made up of parts of various potential control units. The observed outcome for unit *i* at time *t* is

Equation 2

$$Y_{it} = Y_{it}^{N} + \alpha_{it} D_{it}$$

where $D_{it} = \begin{cases} 1 \text{ if } i = 1 \text{ and } t > T_0 \\ 0 \text{ otherwise} \end{cases}$ and Y_{it}^{N} is a factor model where

Equation 3

$$Y_{it}^{N} = \delta_t + \theta_t Z_i + \lambda_t \mu_i + \varepsilon_{it}$$

and δ_t is an unknown common factor with constant factor loadings across units, Z_i is a vector of observed covariates that are unaffected by the treatment intervention, θ_t is a vector of unknown parameters, and λ_t is a vector of unobserved common factors with μ_i unknown factor loadings. The outcome from the donor pool of potential controls is weighted on average using weights as follows: $\{w_i\} 2 \leq j \leq J + 1$.

Choosing Iowa as a Treatment State

Like most states, Iowa received federal funding for sex education during the height of abstinence-only funding. Unlike most states, Iowa conducted a rigorous program impact

evaluation. In 2003, program evaluators from both the University of Iowa School of Social Work, the National Resource Center for Family Centered Practice, and the Iowa Department of Public Health issued a report of the results of fifth year of the Abstinence Education Program in Iowa, funded through Section 510 of Title V (Maternal and Child Health Block Grant) of the Social Security Act (Saunders, Landsman, Graf, & Richardson, 2003). The Abstinence Education Program in Iowa had, as its primary goal, "to reduce the incidence of teen pregnancy and sexually transmitted diseases through abstinence only education" (Saunders et al., 2003, p. 5). What is unique about the program evaluation is that the evaluators were able to also examine an abstinence-plus program within the state of Iowa simultaneously and make comparisons. The abstinence-plus program was funded by the Iowa Department of Human Services, rather than federally (Saunders et al., 2003). The evaluation report indicates that students who received the abstinence-plus program instead of the abstinence-only program (1) "understood better how their decisions about sex could change their futures and felt their goals should not include teen pregnancy," (2) "knew more about body changes during puberty and the costs of an unwanted pregnancy," and (3) were more comfortable talking to their parents or other adults in their lives about sex (Saunders et al., 2003, p. 80).

While the evaluation makes clear that no causal pathway between the two types of programs could be established using the data and research design at hand (Saunders et al., 2003), the evaluation nevertheless impacted the policy directions of sex education in Iowa. This occurred primarily through shifting of funding priorities in Iowa, beginning in 2004, so that a larger share of money spent on sex education went to comprehensive programs. More specifically, under federally-funded abstinence programs, states are required to contribute matching funds. Iowa previously housed its federal funding for abstinence education through the

Iowa Department of Public Health, but began shifting the grant money onto sub-grantees throughout the state that would then either have to raise the money to match the federal funds or cease operation. In 2003, Iowa received $1,163,920 in federal funding for abstinence-only programming; however, in 2004 that number dropped to $1,064,015, and by 2006, it had dropped to $318,198 ("SIECUS - State Profiles," 2013). Based on the direction of funding streams, I estimate that Iowa was largely using comprehensive sex education programs at least by 2006, though the state law was not technically amended to specify comprehensive sex education until 2007 (*Human growth and development instruction.*, n.d., "SIECUS - State Profiles," 2013).

Data

Policy Data

Historical data on state sex education policies was retrieved from the Sexuality Information and Education Council of the United States (SIECUS), which archives information on state policies dating back to 2003 ("SIECUS - State Profiles," 2013). Each state's policy was coded to indicate the type of sex education, or if a state had no policy. These codes were validated by crosschecking historical policy data with the Guttmacher Institute ("State Data Center," 2013). For any inconsistencies between these two sources, I investigated state policies further on a state-by-state basis as needed. Table 4 provides the coding scheme utilized, alongside detailed descriptions of each category of sex education.

Based on this coding, I constructed a panel database containing all states plus the District of Columbia with the state policy on sex education (coded 1-3 as shown in Table 4), graduation rates disaggregated by gender and race, as well as other demographic characteristics of each state, including the percentage change in racial or ethnic minority populations for each year

1995-2012.[9] The data at hand were used for locating a suitable donor pool from which to create a synthetic control. From these data, the states that enacted a policy change during 2003-2009[10] are listed in Table 5. Of note in Table 5 is the timeframe of the policy changes; a few of the states were late to change within the data period, making it difficult to do a before and after comparison for those states.

As Table 5 indicates, there were only seven states that reformed sex education during this time period (2003-2009). Further, there was only one state that changed its policy from abstinence-only to comprehensive sex education: Iowa. This makes Iowa a particularly good case to examine whether comprehensive sex education impacts health outcomes and education outcomes, and eventually the education gradient for minorities. Iowa is an ideal treatment state because of the large policy shock to sex education; all other states that changed their policies made more moderate changes, retaining some of the abstinence curriculum while including some information on contraception. However, the larger policy shock in Iowa is tempered by the challenge of a relatively low percentage of racial or ethnic minority students as compared to some other states such as Texas or California where Hispanic populations are larger. Therefore, it was also important to look at effects overall for young women before examining any possible heterogeneous treatment effects with regards to race and ethnicity.

Table 6 provides some basic comparisons of Iowa's demographic characteristics to those of the average United States. The data for Table 6 were drawn from the American Community Survey (ACS) for 2008-2012. This comparison shows that on average, Iowa is more

[9] The data do not include teen marriage rates as this characteristic is beyond the purview of this project.

[10] Data on state policy changes were available for 2003-2009, and I focus on this sub-set of years as the window around which most policy changes to sex education were enacted.

predominantly White than the rest of the United States. However, it is important to note that the national average includes outlier states that may have significantly larger Black or Hispanic populations. That is, the national average is pulled up by a few states with significantly larger than average numbers. When examining Iowa's characteristics, it has a slightly lower average household income, however, it also has a slightly lower percentage of persons without health insurance. Also of note, the calculated Gini coefficient of income inequality is lower for Iowa than the average for the rest of the country, suggesting that there is slightly less income inequality across Iowa than on average throughout the United States.[11]

If we think that changes to "more" comprehensive sex education will lead to greater impacts, then Iowa should demonstrate this, relative to the other states listed in Table 5. Lastly, Iowa presents a good treatment case because it is not historically different from the rest of the country with regards to sex education. In the context of the other states that changed their sex education policies Hawaii also adopted fully comprehensive sex education. However, Hawaii is probably systematically different than most other states in unobservable ways due to geographic separation from the mainland, and therefore not as strong a candidate for a treatment state. Also, Hawaii changed its policy from abstinence-plus to comprehensive sex education, a lesser change qualitatively in the content of the curriculum. Iowa, on the other hand, changed from completely abstinence-only to comprehensive – and it was the only state to do so.

---

[11] The Gini coefficient is a measure of income inequality wherein 0 represents complete equality while 1 represents complete inequality. For more information see Gastwirth (1972).

Developing the Donor Pool.

Exclusion criteria. In developing a synthetic control state, it is important to know which of the other states also changed their sex education policies. The remaining states listed in Table 5 are not used in the process of deriving a synthetic control state because they each adopted some form of policy change in the same direction as Iowa but to a lesser degree. A more precise counterfactual for Iowa is derived from states that had an abstinence-only policy in place and *did not change* that policy. Therefore, the donor pool of potential matching states does not include states that already had comprehensive sex education, and also does not include states that already had abstinence-plus sex education policies. Drawing from the state policy database I have already collected, the states that had an abstinence-only sex education policy and did not change that policy are listed in Table 7.

Inclusion criteria. There are a number of states that do not have a state-level policy regarding sex education. These states allow local education agencies to make local decisions regarding which type of sex education to provide, or whether or not to provide any sex education at all. It is useful to include states that had no policy in place regarding sex education because there may plausibly exist the same effect for not having a policy as a policy that specifically does not allow information about contraception to be disseminated in schools (i.e. abstinence-only sex education). The states without a state-level policy are given in Table 8. I later exclude theses states in a secondary model to test the robustness of my findings, but for the primary model used for analysis, these states are included.

Having examined all states and their respective policy milieus with regards to sex education is important contextual knowledge when beginning to derive a synthetic control unit for analysis. Ultimately, however, the states used for that derivation must only not have *changed*

their sex education policy to comprehensive during the panel of years under analysis (1995-2012). By defining treatment as *a policy change to sex education to make it comprehensive* allows greater flexibility for finding a synthetic control statistically matched to Iowa. The final model specifications are provided in Chapter 4; the primary model uses states that had abstinence-only sex education or no state policy, and did not experience a policy change (states listed in both Tables 7 & 8).

Outcomes Data

Using Iowa as the treated state, 2006 is the year in which the "treatment," was fully in place for the academic year; the state began off-loading abstinence-education grants on a large scale in 2004. For the analysis, it was necessary to obtain pre- and post- data on outcome variables of interest as well as covariates. Data on all characteristics included in the model date to at least 1995 to produce an accurate pre-treatment trend; a longer time period of available data helps to buttress the pre-treatment trend significantly.[12] I collected data on graduation rates from 1995-2012, calculated from Grade 12 enrollment and graduates from the National Center for Education Statistics' Common Core of Data ("Common Core of Data (CCD)," 2014), dividing total completers by total enrollment per year and subgroup. Graduation rates are typically a better indicator of education attainment than dropout rates because schools often do not categorize all students who fail to graduate as having dropped out (National Research Council & National Academy of Education, 2011).[13]

---

[12] Other authors use 25-50 years of data. See Abadie et al (2010), Abadie et al (2014), and Cunningham & Shah (2014).

[13] See discussion in Chapter 2.

Another measurement of education outcomes is National Assessment of Educational Progress (NAEP) scores. When comparing two states along educational measures, it is important not to use state-level achievement tests because each state's testing regime differs, as do raw score scales and cut scores. However, NAEP achievement scores are derived from a national test, making state-to-state comparisons more valid. Graduation rates are a more generalized indicator of education attainment than are achievement scores. However, NAEP achievement scores are not available for the entire time period (1995-2012). Further, the NAEP assessment is not administered annually, and therefore should not be used in a synthetic control model because there are significant gaps in the panel of data.

The health outcomes of interest are adolescent birth rates. These data are available through the Centers for Disease Control and Prevention's WONDER natality data for the1995-2012 period. The CDC's WONDER data provides a record of all live births with indicators such as race and the age of the mother ("Natality Information," 2014). Birth rates were calculated by aggregating birth records to the state level, and matching them to the population estimates for each subgroup provided by the U.S. Census Bureau. The birth rate is a simple division of the number of live births by the total population. For subgroups, this was calculated using respective subgroup population counts. Because these rates are low, I follow the usual protocol for analyzing adolescent birth rates and calculate them at per 1,000 persons.

Matching Data

In the construction of a valid synthetic control, it is important to match potential donor states to the treatment state on relevant covariates, but not the variables that are outcomes of interest in the post-treatment period for the subgroup under investigation. Specifically, I do not match Iowa on teen birth rates or graduation rates from the post-treatment period (2005 - 2012).

The synthetic control, however, closely matches Iowa along other important dimensions in order to model a counterfactual Iowa that did not adopt comprehensive sex education. It is appropriate to match on a variety of observable state characteristics for the economic landscape of each state, population demographics, and schooling characteristics.

The synthetic control method allows the creation of a control state that not only mirrors the treatment state along observable characteristics, but also, hopefully, mirrors the treatment state along unobservable dimensions. Because I can only match on observable characteristics, it is important that they are relevant to the research question and broadly provide descriptive information about the states. For example, since a large change in population of racial or ethnic minority girls might impact the education outcomes of racial or ethnic minority girls when aggregated to the state level, it is useful to control for changes to overall population dynamics. Hispanic girls typically have lower graduation rates; therefore, if there were a large increase in Hispanic girls within the population, graduation rates would likely decrease regardless of any education or health intervention. Table 14 provides more details regarding the changes to the overall Hispanic population in Iowa, all other states, and the donor states identified (listed in Table 10). A full listing of the demographic indicators used to develop a synthetic control state is provided in Table 13. A listing of schooling characteristic indicators is provided in Table 15.

Because some control variables are appropriate for constructing the synthetic control model for graduation rates but not for birth rates, and because finding a good fit for each synthetic model is important and subject to idiosyncrasies of the matching capability of each variable, each synthetic model does not necessarily include the same variables used for matching. Chapter 4 provides a full discussion of the process used to construct each synthetic control unit, along with tables of the predictor variables used in each model.

CHAPTER 4: ANALYSIS

In this chapter, I first provide a description of the sample used for analysis, beginning with basic information such as the origin of the data, the number of observations, the donor pool used to create a synthetic control unit, and basic descriptive statistics. Next, I provide a description of trends across outcomes of interest to this project: graduation rates and adolescent birth rates. After examining pre-treatment trends in the control states in comparison to trends in Iowa, I proceed with the synthetic control analysis. Following the synthetic control analysis for each subgroup and outcome of interest, I provide a variety of robustness checks to explore the reliability of my findings. The robustness checks include placebo tests to draw causal inferences and supplementary fixed effects panel regression.

Data Description

For each variable, data was gathered from publicly available sources. The origin of each variable, as well as indicators if imputation was used, is also provided in Appendix Table 1. Because this study examines the effects of a state-level policy shock, the unit of analysis is the state. All data used for analysis were aggregated up to the state-level if they were not already provided at that level. In some cases it was necessary to linearly interpolate values in order for the synthetic control package to formulate trends. In those cases, imputation is flagged in Appendix Table 1; data were linearly interpolated using the Stata command *ipolate*. Approximately 1% of observations were linearly interpolated.

Donor Pool

Following the work of Abadie, Diamond, & Hainmueller (2014), when constructing a synthetic control, "it is important to restrict the donor pool to units with outcomes that are thought to be driven by the same structural process as the unit representing the case of interest and that were not subject to structural shocks to the outcome variable during the sample period of the study" (p. 4). For this study, the structural process is sex education – the process through which the outcome of interest is impacted, and the structural shock is a *change* to sex education policy. To restrict the donor pool by the criteria set forth by Abadie et al (2014), I discarded states that had abstinence-plus or comprehensive sex education. I then excluded from this pool any states with any *changes* to sex education policy. States without a statewide policy are excluded later as a robustness check. Because they *may or may not* include information about contraception in sex education, these states are later excluded to construct a highly conservative estimation strategy to test the reliability of the findings from the primary model. States *with* abstinence-plus or comprehensive sex education include information about contraception, and are thus excluded from the donor pool, keeping in line with the theory that the type of sex education matters to immediate outcomes such as teen childbirth, as well as to secondary outcomes such as increases in graduation rates.

Referring back to Figure 4 from Chapter 3, states undergoing the same treatment (a policy change to make sex education comprehensive) or that already have a policy that is substantially similar to comprehensive sex education (such as abstinence-plus) in key characteristics (such as including discussion of contraception in the curriculum), should not be used as potential matched comparison units. Those states would be somewhere beyond the left side of the diagram where comprehensive sex education is adopted, and the health and

educational outcomes on the right-hand side of Figure 4. Potential donor states need to have a policy environment around sex education that is similar to Iowa's during the pre-treatment time period (1995-2005).

Table 10 lists states that were included as donor states – states that had abstinence-only sex education or no statewide policy, and did not experience a policy change. The synthetic control was created based on the states listed Table 10.

Descriptive Statistics

I compiled a dataset that contains 51 states (all states plus D.C.) over 18 years (1995-2012), for a total of 918 observations. Data that were available at the individual level were aggregated up to the state level. After dropping the states excluded through the a priori method described above, as well as Iowa, the total number of observations used for matching was 378.

Birth rates. Table 11 shows summary statistics for adolescent birth rates for racial and ethnic subgroups. Birth rates are calculated per 1,000 persons. Overall, birth rates for adolescents aged 15-19 were 42.66 per 1,000 when including all three racial subgroups. The within-state variance for adolescent birth rates is very low for White adolescents (5.09 per 1,000), but higher for Black and Hispanic adolescents (15.96 per 1,000 and 19.65 per 1,000 respectively). The fact that the within-state variance is larger than the between-state variance for adolescents ages 15-19 suggests birth rates may vary more by year than by state.

Graduation rates. Table 12 provides descriptive statistics for all graduation rates by race and ethnicity and by gender. Of note in the summary statistics for graduation rates is that the amount of variation within states is larger than that between the states. Similar to birth rates, this implies that graduation rates likely vary more over time within states rather than between states. This study is primarily interested in the within-state variation -- specifically in the trends of

graduation rates in Iowa compared to a synthetic control unit in the post-treatment time period. Higher variation within Iowa helps the analysis detect changes due to the policy change, while lower variation between the states means that the likelihood that Iowa will fall within the convex hull of the donor states is higher.[14]

Graduation rates represent the only measure of education attainment used in the analysis. While it would have been useful to include a measure of educational achievement to take into account the overall performance of the education system in each state, no such measure was consistently available. Due to the decentralized nature of the American education system, no single standardized achievement test is available to provide comparable achievement scores across all states.[15]

Building a Synthetic Model

In analysis of synthetic controls, outcome variables other than the dependent variables for a specific model may be included as predictor variables (i.e. adolescent birth rates can be included in the synthetic control model for graduation rates). This is following Abadie et al's (2010) suggestion that matching on outcomes from the pre-intervention time period can help control for unobserved factors, and also for the heterogeneity of the effect of both the observed and unobserved factors on the outcome of interest. Abadie et al (2014) clarify this further:

---

[14] For discussion of the convex hull see Abadie et al (2010).

[15] The National Assessment of Educational Progress (NAEP) does provide a homogenous measure of academic achievement for a statistically representative sample across all states. However, the assessment is only administered every four years, and data is not widely available for Grade 12 assessments. Because this study relies on panel data and is interested in high school age students, NAEP scores were insufficient as a measure of student achievement for analysis in this study.

> ...only units that are alike in both observed and unobserved determinants of the outcome variable as well as in the effect of those determinants on the outcome variable should produce similar trajectories of the outcome variable over extended periods of time (p. 7).

Equation 4 shows that the outcome variable (dependent variable) is a function of a constant (α), a series of control (predictor) variables, and an error term (ε).

Equation 4

$$depvar_{Post-treatment} = \alpha + \beta_1[predictor\ var] \ldots + \beta_k[predictor\ var] + \varepsilon$$

The dependent variable under analysis *can also* be included, but only using data from the pre-treatment time period. Abadie et al (2010) specify that observed covariates that are unaffected by the treatment are used to weight potential donor units to derive the synthetic control unit. This means that graduation rates, in the pre-intervention period, can be included, as they are not affected by the treatment during the pre-intervention time period. This is shown in Equation 5.

Equation 5

$$depvar_{Post-treatment} = \alpha + \beta_1[predictor\ var] \ldots + \beta_k + \lambda[dep\ var]_{Pre-treatment} + \varepsilon$$

While the pre-treatment data for the dependent variables of interest can also be used (such as graduation rates from 1995-2005[16]), the primary data used to match states to derive a synthetic

[16] As discussed in Chapter 3, Iowa began shifting federal grant monies onto sub-grantees substantially in 2005, meaning that comprehensive sex education *could* have been implemented in some areas in 2005. Due to the nature of the way the policy was changed, the treatment date is fuzzy, and caution should be used in interpreting trends as they change during the years 2005-2007 because of this.

control are observable state characteristics. Table 13 shows summary statistics for observable characteristics.

Observable State Characteristics

I used the following measures that depict the economic landscape during each year, in each state: percent of the population living in poverty, percent of the population receiving food stamps, state annual unemployment rate, inflation-adjusted per capita income, and the Gini coefficient for income inequality. Inflation-adjusted per capita income provides a picture of the average income per person. Table 9 shows the inflation conversion rates used for adjustment to the value of the dollar in 2013 – the latest year conversion factor available at the time of this analysis. The Gini coefficient is a measure of statistical dispersion used frequently to measure income inequality. There are many variants of the original Gini coefficient first proposed in 1912; the data used for analysis in this project follows the compromise Gini coefficient proposed by Cowell and Mehta (1982) wherein the lower limit of the Gini is constructed based on the assumption that all individuals in a group receive exactly the mean income of the group:

Equation 6

$$G_L = \frac{1}{2}\sum_{i=1}^{k}\sum_{j=1}^{k}\frac{n_i n_j}{n\mu}\left|\mu_i - \mu_j\right|$$

where n is the number of individuals and subscripts i and j denote within-group values, and the upper limit Gini can be derived using the assumption that individuals within the group receive income equal to either the lower or the upper bound of the group interval:

Equation 7

$$G_U = G_L + \sum_{i=1}^{k}\frac{n_i^2(a_{i+1} - \mu_i)(\mu_i - a_i)}{n^2\mu(a_{i+1} - a_i)}$$

allowing for the compromise Gini coefficient to be calculated with:

Equation 8

$$G_U 2/3 + G_L 1/3$$

(Cowell & Mehta, 1982; Frank, 2009).

In addition to the economic measures, Table 15 also shows descriptive statistics for observable schooling characteristics for each state. The observable schooling characteristics allow me to match states along education dimensions that would not be impacted by the policy change. Characteristics such as student-teacher ratios and per-pupil spending would not change in response to a policy change around sex education.[17] Matching on schooling characteristics that are not impacted by the policy change allows to the synthetic control unit to match along pre-intervention outcomes that might be related to graduation rates. Based on the work of Abadie et al (2010), matching on observed characteristics in this way allows the synthetic control model to theoretically allow for unobserved characteristics that vary over time (p. 495).

Lastly, Table 13 also contains summary statistics for observable population characteristics. The change in the overall percentage of the Black population for each state and the change in the overall percentage of persons of Hispanic origin in each state are provided. These racial and ethnic categories are based on Census reporting categories available for the entire time period (1995-2012). High levels of immigration in some states could downwardly bias estimates of graduation rates if there was high influx of newly immigrated students who were entering high school without fluency in the English language.

---

[17] I also collected data on whether or not states required a high school exit exam, the number of students receiving free lunch, and the number of students enrolled with an individual education plan (IEP). However this data was eventually taken out of the analysis due to either lack of correlation between the measure and the outcome of interest or collinearity with another measure of a similar observable state characteristic.

Additional descriptive data on the percent change of the Hispanic population by state is provided in Table 14. The change in the percentage of state population that is of Hispanic origin is important to match on due to the concern over downwardly biased estimates. Referring to Table 14, the descriptive statistics reveal that the proportion of the population of Hispanic origin in Iowa increased on average by 1.89% over the entire 18 years. This proportion increased on average by 2.45% in the rest of the United States. For the states identified as potential donors, the proportion of Hispanic origin population increased by 2.37%. As expected, the increase in Hispanic population in Iowa was less than the rest of the country. It is also less than the average for the potential donor states, but it is closer to the potential control states than an average of all other states. The synthetic control method further narrows the potential control states by matching on pre-treatment trends, thus allowing the analyst to identify which of the potential control states best matches Iowa in terms of increases to the Hispanic population each year.

Parallel Trends

Before examining a possible fit between Iowa and a synthetic control, it is useful to examine trends in the outcome variables of interest for Iowa and the average of all potential control states. The synthetic control method capitalizes on observable characteristics of possible comparable states to find the most appropriate comparison unit(s). Without similar trends in the pre-treatment time period for Iowa and the possible control states, it would be unlikely that the synthetic control method would be feasible to calculate a synthetic control unit. The presence of parallel trends in the pre-treatment time period suggests that Iowa is within the convex hull of its potential control states. Figures 5-11 show the trends of outcome variables for Iowa and the average of the all 21 of the potential donor states.

Birth Rates. For women aged 15-19, birth rates in Iowa overall are lower than the

average of the 21 potential donor states, though they do follow the same trend pattern (see Figure 5). This is true for White adolescents, aged 15-19 (Figure 6), but not for Black or Hispanic adolescents (Figures 7 and 8) whose birth rates are higher overall and over time in Iowa when compared to the average of the potential donor states[18]. Figure 8 shows that birth rates for Hispanic adolescents were declining in both Iowa and on average in the potential donor states across the entire time period (1995-2012), but with a steeper decline during the post-treatment time period (2006-2012). The birth rates of Black adolescents (Figure 7) also portray an overall slow decline in both Iowa and on average for the potential donor states, but do not appear to be as sharply in decline in the post-treatment time period.

Graduation Rates. Overall, the comparison of graduation rates in Iowa and the potential control states shows parallel trends in the pre-treatment time period. This suggests that Iowa is in the convex hull for this outcome measure. There is some variation between Iowa and the average of the 21 potential donor states in the post-treatment time period; however, the evidence of parallel trends is only needed in the pre-treatment time period.

The data suggest that when compared to the average across the potential donor states, the graduation rate in Iowa among White, female students is very similar to the graduation rate of White, females in the potential donor states in the pre-treatment time period (see Figure 9). There is some difference in the trends in the post-treatment time period for White, female graduation rates, but the difference between the trends appears minimal. Figure 10, however, shows a somewhat different trend comparison for Black, female graduation rates. The trend lines for

---

[18] While the overall level of the birth rates are not important to the synthetic control method, I point this out here to foreground my discussion in Chapter 5 of the differences between birth rates between racial and ethnic subgroups.

Black, female graduation rates for Iowa and the average of potential donor states in the pre-treatment time period are very similar, but begin to diverge in 2003. Figure 11 shows similar trends for Iowa and the average of the potential donor states for Hispanic, female graduation rates throughout the entire time period, albeit with volatility in the data.[19]

Analysis

The previous section compares outcomes of interest in Iowa to the average of the all of the 21 potential donor states. The advantage of a synthetic control unit is that it provides a more accurate unit for comparison than a simple average because it compares Iowa not to all of the states possible for comparison, but rather to a counterfactual Iowa that is statistically derived based on observable state characteristics. The following sections provide a description of the synthetic control method, applied to each outcome of interest, a presentation of the findings from the analysis, and some robustness checks of the findings.

Birth Rates

Recalling Figure 4, I hypothesized that a policy change to sex education from abstinence-only to comprehensive would reduce adolescent birth rates. The structural form of the causal pathway is such that the policy change should decrease adolescent birth rates, and through that reduction increase graduation rates. The first stage of my estimation, then, examines the impact of the policy change on adolescent birth rates. I hypothesize that birth rates in Iowa in the post-

---

[19] Cunningham & Shah (2014) use a moving average to reduce volatility in outcome data in their use of the synthetic control method. The volatility in all subgroups of the graduation rates data led me to explore the option of using a moving average. However, whereas the moving average reduced volatility and produced a closer fit between the synthetic control and the treatment unit (as evidenced by reductions in RMSPE's and improved graphs), this was at the expense of suppressing information about the changes to outcome variables over time. In the end, a moving average was useful for identifying the underlying pattern, but it was not necessary to the analysis, and I followed a preference for raw data.

treatment time period will be lower than birth rates in synthetic Iowa in the post-treatment time period.

Aggregate birth rates. Table 16 shows the matched variables for adolescent birth rates, aggregated to include the three racial and ethnicity subgroups used in this study. Additionally, Table 16 provides the potential control states used and the weights for those potential control states that were actually used in the analysis. For overall adolescent birth rates, the synthetic control is comprised of Utah, Massachusetts, Mississippi, Texas, and Wisconsin, with weights indicated in Table 16. These matches were predicted on the following measures for the pre-treatment time period (1995-2005): adolescent birth rates, percent of the population in poverty, state annual unemployment rate, the percent change in Hispanic population, the percent change in Black population, inflation-adjusted per capita income, and the Gini coefficient. Table 16 shows the comparison between the treatment and synthetic predictor variables; all predictor variables exhibit a close match between Iowa and the synthetic control.

Figure 12 graphically depicts the comparison between Iowa and synthetic Iowa for adolescent birth rates, aggregated to include the racial and ethnic subgroups under analysis in this study. From 2005-2011, the control group and Iowa have approximately the same birth rates. Birth rates in Iowa began to diverge and drop lower than the control group starting in 2011, but this is several years after the policy change, and the gap between the trend for Iowa and synthetic Iowa is small. The synthetic control analysis suggests that adolescent birth rates, when aggregated to include all the racial and ethnic subgroups included in the analysis, do not appear to be impacted by the policy change to sex education.

White adolescent birth rates. Table 17 provides a listing of the matched variables and resulting matches as well as donor states and weights. All predictor variables provide a close

fit between Iowa and synthetic Iowa. When birth rates are disaggregated by race and ethnicity, however, the number and content of the potential control states changes; for White, adolescent birth rates, Kentucky, Utah, and Wisconsin are used to derive a synthetic control for Iowa. Figure 13 shows the birth rates for White adolescents in Iowa relative to synthetic Iowa. In both the pre-treatment and post-treatment time periods White, adolescent birth rates are not noticeably different between Iowa and its synthetic control. The synthetic control analysis suggests that White, adolescent birth rates were not impacted by the policy change to sex education.

Black, adolescent birth rates. Table 18 shows the predictor variables and resulting matches for Black, adolescent birth rates. The matches for predictor variables are not as close for Black, adolescent birth rates as they are for aggregate, adolescent birth rates or White, adolescent birth rates; however, they are reasonably similar. Black, adolescent birth rates proved to be the most volatile outcome measure throughout the analysis, and accounts for the less close fit seen in Figure 14, as compared to other subgroup birth rates. Four of the 21 potential control states were used to derive the synthetic control: Kentucky, Massachusetts, Texas, and Wisconsin. Figure 14 shows the trends for Black adolescent birth rates for Iowa and synthetic Iowa are similar in both the pre-treatment and post-treatment time period. Beginning in 2007, Black, adolescent birth rates in Iowa rose slightly above the synthetic control group. This suggests that birth rates in Iowa are not lower than birth rates in synthetic Iowa in the post-treatment time period.

The data are volatile, so whether or not Black, adolescent birth rates actually rose above the synthetic control group is not readily apparent. Following the work of Abadie et al (2014), I

conducted an in-space[20] placebo test to check the robustness of the synthetic control analysis for Black, adolescent birth rates. For this robustness check, each potential donor state is analyzed as if it were the treatment state. The resulting root mean square error terms (RMSE) from each analysis are plotted as a ratio between the RMSE in the post-treatment time period and the RMSE in the pre-treatment time period. Figure 15 shows the distribution of the ratio of RMSE terms from the in-space placebo tests for Black, adolescent birth rates. If the difference between Iowa and synthetic Iowa is statistically significant, the RMSE for Iowa will fall well outside of the distribution of the placebo RMSE terms. Figure 15 shows that it does not. This means that I am unable to identify an effect, either positive or negative, of the policy change on Black, adolescent birth rates.

Hispanic, adolescent birth rates. Table 19 shows the predictor variables and resulting matches for Hispanic, adolescent birth rates. I expected that matching Iowa to donor states for outcomes disaggregated by race and ethnicity for Hispanic adolescents would be difficult due to the low proportion of the Hispanic population in Iowa in comparison to many other states. This was the case, and the list of predictor variables for Hispanic, adolescent birth rates was expanded to include the percent of the population receiving food stamps. As seen in Table 19, the match between Iowa and synthetic Iowa for inflation-adjusted per capita income is not as close as the other subgroups. Adding an additional measure of poverty (percent of population receiving food stamps) helped to identify the convex hull for Iowa for Hispanic adolescent birth rates.

---

[20] Abadie et al (2010) and Abadie et al (2014) provide thorough description of the use of "in-space" placebo tests for synthetic control methods. They also provide description of "in-time" placebo tests wherein the treatment is falsely placed at other points in time to test the robustness of the difference between the treated unit and the synthetic control unit. For adolescent birth rates, there are no years in the pre-treatment time period in which the treated and synthetic control trend lines differ, thus eliminating the need for an "in-time" placebo check.

Unsurprisingly, the donor states for this subgroup differs from the other subgroups' adolescent birth rates, with Texas no longer being used to derive a synthetic control. The synthetic control has to be derived based on observable characteristics, and it is likely that the percent change in the proportion of Hispanic population per state was too different in Texas for it to remain a donor state for Hispanic, adolescent birth rates.

Figure 16 shows the trends for Hispanic, adolescent birth rates for Iowa tracking largely the same as those for synthetic Iowa in both the pre-treatment and post-treatment time periods. This suggests that there is insufficient evidence of an effect of the policy change on Hispanic, adolescent birth rates. The distribution of the ratio of RMSE terms for "in-space" placebo tests is shown in Figure 17. The distribution of RMSE ratios shows that the RMSE ratio for Iowa is not larger than the rest of the distribution. Therefore, the data suggest that Hispanic, adolescent birth rates in Iowa were greater than or equal to synthetic Iowa in the post-treatment time period.

Further robustness checks. I provide further robustness checks of the synthetic control findings for adolescent birth rates through two approaches: a reduction of the control group and a fixed effects regression.

Reduction of control group as robustness check. The group of potential control states includes 21 states that had abstinence-only sex education or no state-wide policy for sex education, and did not experience a policy-change during the pre-treatment time period. A further robustness check of the findings from that analysis is provided by reducing the group of potential control states to only include those states that had abstinence-only sex education and no policy change during the pre-treatment time period. This severely restricts the group of potential donor states to only seven: Florida, Indiana, Kentucky, Michigan, Ohio, Pennsylvania, and Utah.

This represents a more conservative estimation strategy by restricting potential donor

states to those that strictly mirrored Iowa in terms of sex education policy in the pre-treatment time period. By removing states that did not have a state policy on sex education, I take out those states whose adolescent birth rates might be affected by the *omission* of state policy because these states may have had some unofficial teaching going on, focusing only on states whose birth rates would be impacted by the *commission* of a state policy – the same as in Iowa. The reduced potential donor group is compromised of states where the government actively enacted abstinence-only sex education. This reflects a nuanced difference between state policy milieus. States with abstinence-only education represent policy milieus where the desired outcomes of sex education is actively sought to combat issues like teen childbirth.[21] A state policy for sex education suggests that these areas were already viewed as either a problem to be addressed, or at the least, an area of concern enough to warrant state action.

These states, like Iowa, have a demonstrated interest in sex education, and have chosen the same policy that Iowa had in the pre-treatment time period. On the other hand, states without a state-level policy on sex education do not have a demonstrated interest in sex education. This nuance could be an unobservable, state-level characteristic relevant to the impetus to enact sex education policy. The potential donor states in the reduced control group, however, *did not* switch to comprehensive sex education like Iowa – a policy action that could suggest either a change in an unobservable characteristic of Iowa, or a pre-existing difference on an unobservable characteristic of Iowa.

---

[21] Other issues such as sexually transmitted infection and disease and overall adolescent pregnancy rates are often thought to be addressed by sex education, but are beyond the scope of this study.

By restricting the donor pool to states that already have a demonstrated interest in sex education, I further isolate these potential unobservable characteristics.[22] Referring again to Figure 4, unobserved state characteristics could potentially impact not only adolescent birth rates, but also the adoption of comprehensive sex education, improvements to educational outcomes, and improvements to other health outcomes.

For aggregate, adolescent birth rates, I am still unable to identify an effect of the policy change when using the reduced potential control group (see Figure 18 and Table 20). I also find no evidence of an effect on White, adolescent birth rates when using the reduced potential control group (see Figure 19 and Table 21). For Black, adolescent birth rates, analysis of the synthetic control derived from the reduced potential control group also shows no evidence of an effect of the policy change (see Figure 20 and Table 22). For Hispanic, adolescent birth rates, the reduced potential control group also shows no evidence of an effect of the policy change (see Figure 21 and Table 23). In the post-treatment period for Hispanic, adolescent birth rates, Iowa is below synthetic Iowa. However, "in-place" placebo tests reveal that this gap is not statistically significant (see Figure 22) and is therefore likely attributable to either the volatility of the data or random error.

Fixed effects. I present a fixed effects regression analysis for adolescent birth rates to check the robustness of my findings from the synthetic control analysis. The fixed-effects estimator uses all of the 21 potential control states as comparison states. That is, states are used for comparison based only on the a priori reasoning for including states as potential control states. This is different from the synthetic control method which only uses states that are similar

[22] This is done at the expense of statistical power. The reduced potential donor group yields only 126 observations across the 18-year panel with which to match Iowa on observable characteristics.

on observable characteristics. The linear formula for the fixed-effects estimation is shown in Equation 9.

Equation 9

$$Y_{it} = \alpha_i + PolicyChange_{it} + \acute{X}_{it}\beta + \gamma_t + \varepsilon_{it}$$

where $PolicyChange_{it}$ is the treatment variable impacting state *i* (Iowa) in time *t* (2006-2012), α_i are individual-specific fixed effects, $\acute{X}_{it}$ is a scalar of regressors, γ_t is a year fixed effect, and ε_{it} is an idiosyncratic error term. The fixed effects model eliminates the time-invariant portion of the composite error[23] term, α_i, through mean differencing. This leaves only μ_{it}, the time-varying unobserved portion of the composite error term.[24]

In contrast to this, the synthetic control model "extends the traditional linear panel data (difference-in-differences) framework, allowing that the effects of unobserved variables on the outcome vary with time" (Abadie, Diamond, & Hainmueller, 2010b, p. 494). Because of this property of the factor model in the synthetic control, it yields more precise estimates.[25] When comparing their fixed effects estimations to synthetic control estimations, Cunningham & Shah (2014) note that the synthetic control found more conservative estimates. The fixed effects model allows me to relax the assumptions of time-varying, unobserved effects.[26] Additionally, the synthetic control analysis only includes comparison states that closely resemble Iowa in the pre-

---

[23] $\varepsilon_{it} = \alpha_i + \mu_{it}$, where α_i are time-invariant and unobservable and μ_{it} are time-varying and unobservable.

[24] For a more robust discussion of the fixed effects estimator see Cameron and Trivedi (2010) Woolridge (2013).

[25] See Abadie et al, 2010, Appendix B for mathematical proof of synthetic control estimation of time-varying, unobservable characteristics.

[26] The time- and state-fixed effects remove all variance along those dimensions, thus accounting for unobserved characteristics. However, this also removes the time-varying unobservable characteristics for which the synthetic control model is able to match on theoretically.

treatment period, along observable characteristics. In contrast, the fixed effects estimation uses 21 out of the 21 potential control states. If there is no effect from the fixed effects estimate, then the finding of no effect from the synthetic control analysis is further supported.

Table 24 provides results from the fixed effects analysis of all subgroups for adolescent birth rates. In this estimation aggregate, adolescent birth rates and White adolescent birth rates increase after the policy change and are statistically significant. I used the restricted donor pool to see if the significant findings from the fixed effects estimation would hold when assumptions about the comparability of states to Iowa were tightened. Table 25 reveals that, when using the reduced control group, there are no statistically significant effects of the policy change on adolescent birth rates. Therefore, the findings from the synthetic control are supported and I conclude that there was no evidence of a reduction in adolescent birth rates in response to the policy change to sex education.

Graduation Rates

The second stage of my estimation, examines the impact of the policy change on graduation rates. Following the causal pathway in Figure 4, adolescent birth rates are included in the analysis: the policy change could lead to a decrease in adolescent births, and a decrease in adolescent births might lead to an increase in graduation rates.This causal pathway (drawn from Figure 4) suggests that graduation rates in Iowa will be higher in the post-treatment time period than graduation rates in synthetic Iowa in the post-treatment time period. If graduation rates in Iowa are lower than or equal to synthetic Iowa in the post-treatment time period, then the policy change did not positively impact female graduation rates.

White, female graduation rates. The synthetic control for White, female graduation rates is derived from Utah, Colorado, Massachusetts, Mississippi, Montana, and Texas. Table 26

provides a list of the weights used for each potential donor state, as well as predictor variables for this model. The predictor variables for graduation rates are expanded from those used for the birth rates estimation, and include measures of state education-related observable characteristics. These include average student-teacher ratios and per pupil spending. All predictor variables closely match synthetic Iowa to Iowa. Figure 23 shows the trends for White, female graduation rates for Iowa and synthetic Iowa. The trends are very similar in the pre-treatment time period, with some slight distance between them beginning in 2005 – just before treatment. However, even though a great deal of the state was using comprehensive sex education in 2005 due to the reassignment of federal grants to local agencies (see Chapter 3), it is reasonable to expect that the effects of the policy change would not be identifiable immediately. Further investigation using "in-space" placebo tests shows that the gap between Iowa and synthetic Iowa is not statistically significant (see Figure 24).

Black, female graduation rates. The synthetic control for Black, female graduation rates is derived from Utah, Colorado, Montana, and Wisconsin. Table 27 provides a list of the weights used for each potential donor state, as well as predictor variables for this model. The predictor variables included in this model differ from those used to estimate White, female graduation rates only by racial subgroup of pre-treatment graduation rates and adolescent birth rates (only Black, female graduation rates and Black, adolescent birth rates are used in this model, while White, female graduation rates and White, adolescent birth rates were used in the previous model). The match between the predictor variables is close overall, and Iowa and synthetic Iowa are visually matched on Figure 25. Figure 25, however, depicts a possible negative effect on Black, female graduation rates in the post-treatment time period. Beginning in 2005, graduation rates for Black, female students in Iowa begin to fall below the control group.

Figure 26 shows the results of an "in-place" placebo test for Black, female graduation rates. Once again, the ratio of post-treatment to pre-treatment RMSE for Iowa is not outside of the distribution of the placebos, suggesting that the difference we can see visually on Figure 25 is not statistically significant. Further investigation of this is provided below in the section on additional robustness checks for graduation rates.

Hispanic, female graduation rates. For Hispanic, female graduation rates, the synthetic control unit was derived from the following states: Michigan, Utah, Massachusetts, Mississippi, Texas, and Wisconsin. Table 28 provides a list of the weights used for each potential donor state, as well as predictor variables for this model. As for White and Black female graduation rates, predictor variables are matched to Hispanic, females only in terms of pre-treatment graduation rates and adolescent birth rates. The match between Iowa and synthetic Iowa is close overall in the pre-treatment time period. Figure 27 shows the trends for Hispanic, female graduation rates close to one another up until 2006. During the post-treatment time period, the data become more volatile. While Iowa and synthetic Iowa are not exactly the same in the post-treatment time period, there is no discernable pattern to suggest either a positive or negative treatment effect. The placebo test shown in Figure 28 reveals that Iowa's RMSE ratio is not larger than the distribution of the placebos, suggesting that the divergence seen in the post-treatment period in Figure 27 is not attributable to the policy change.

Further robustness checks. I provide further robustness checks of the synthetic control findings for female graduation rates through the same two approaches used previously for adolescent birth rates: a reduction of the control group and a fixed effects regression.

Reduced control group as robustness check. As with adolescent birth rates, I use a reduced control group to test the robustness of the synthetic control findings for female

graduation rates. For White, female graduation rates, there is insufficient evidence of an effect of the policy change when using the reduced potential control group (see Figure 29 and Table 29). For Black, female graduation rates, the synthetic control derived from the reduced potential control group is very similar to that of the full control group (see Figure 30 and Table 30). Figure 31 shows the "in-space" placebo test for Black, female graduation rates when using the reduced control group. For this placebo test, Iowa does have the highest RMSE ratio; however, it is not much higher than the next highest RMSE ratio (Florida), meaning that the possible negative effect of the policy change is still not significant.

For Hispanic, female graduation rates, the reduced potential control group shows a somewhat different trend than when using the full donor group. Table 31 provides the predictor variables and control state weights for Hispanic, female graduation rates using the reduced control group. Figure 32 shows the trends for Iowa and synthetic Iowa for Hispanic, female graduation rates when using the reduced control group. Figure 32 shows Hispanic, female graduation rates closely matched to the synthetic control until 2009, when they rise above the synthetic control group. One might imagine that this is a lagged effect of the policy change – that graduation rates were not impacted until the first cohort that may have received the treatment (a change to sex education) would be graduating. Considering that the treatment year used for analysis, 2006, is fuzzy due to the state's relinquishing grant money used to fund abstinence-only sex education beginning in 2004 and largely finishing in 2006, it is *possible* that those students who received comprehensive sex education in 2005 would be graduating in 2009. However, the "in-space" placebo test shown in Figure 33 demonstrates that this was not the case. Any difference between Hispanic, female graduation rates in Iowa and synthetic Iowa in the post-treatment time period are not outside the distribution of all placebos and their respective

synthetic controls. As shown in Figure 33, the RMSE ratio for Iowa falls in the middle of the distribution, meaning that the difference between Iowa and synthetic Iowa is not significant.

Fixed effects. As with adolescent birth rates, I use fixed effects estimation to further substantiate my findings from the synthetic control analysis. The fixed effects model is less conservative in its inclusion of all 21 donor states. If there is no effect of the policy change on graduation rates from the fixed effects estimator, then the finding of no effect from the synthetic control analysis is further supported. Table 32 provides the results of the fixed effects estimation. This model finds a statistically significant negative impact on White and Black, female graduation rates. However, when the reduced control group is used for analysis, there are no statistically significant effects (see Table 33). Therefore, the findings from the synthetic control are supported and I conclude that there is no evidence of an increase in female graduation rates in response to the policy change to sex education.

Conclusion

I do not find sufficient evidence of an effect of the policy change to sex education on adolescent birth rates or on female graduation rates from the results of the empirical analysis. A discussion of these findings follows in Chapter 5.

CHAPTER 5: DISCUSSION

In this chapter, I discuss the implications of the findings from the analysis in Chapter 4. I begin this discussion by providing a synthesis of my findings with respect to my research questions. Next, I return to the relevant topics discussed in Chapters 1 and 2 to offer discussion in light of my findings. The discussion of themes from Chapter 2 includes the role of feminism in sex education, a discussion of high school completion and teenage pregnancy and childbearing, the education gradient, and whole-child reform movements in education. I conclude Chapter 5 with a discussion of the limitations of this study and future directions for further research.

Research Questions

I now return to my research questions this study sought to answer. I discuss my findings separately for each research question.

Research Question 1

My first research question was as follows:

1. Did Iowa's policy changes to sex education improve health and education outcomes for female adolescents, particularly for racial and ethnic minorities?

Health. Using the data described in this paper and the method of analysis described in this paper, I find no effect of the policy change on aggregate adolescent birth rates in Iowa. When disaggregated by subgroup, the synthetic control model shows no effect on birth rates for

White, Black, or Hispanic adolescents in Iowa using the data that I analyzed. Therefore, in answer to the first research question, I do not find sufficient evidence that the policy change to sex education improved health outcomes (as measured by adolescent birth rates) overall in Iowa.

Education. I also did not find sufficient evidence of an effect of the policy change on female graduation rates in my analysis. In answer to the first research question, the policy change did not improve education outcomes (as measured by graduation rates) for female adolescents in Iowa, given the data and method of analysis used.

Research Question 2

My second research question was as follows:

2. Did the policy change to sex education in Iowa impact all subgroups (by gender and race and ethnicity) the same or differently in education outcomes as measured by graduation rates?

In examining the analysis of graduation rates, I explored the causal impact of a policy change to sex education on graduation rates, stratified by gender and race in Iowa. Using the data described in this paper and the method of analysis described in this paper, the empirical analysis revealed no effect on the graduation rates of White, Black, and Hispanic female students in Iowa. Using the data described in this paper and the method of analysis described in this paper also does not provide sufficient evidence of statistically significant heterogeneity in the lack of an effect of the policy change on graduation rates in Iowa.

Research Question 3

My third research question was as follows:

3. Did the policy change to sex education in Iowa impact all subgroups (by race and ethnicity) the same or differently in health outcomes?

Using the data described in this paper and the method of analysis described in this paper, my analysis of the causal impact of a policy change to sex education to make it comprehensive on adolescent birthrates in Iowa did not find sufficient evidence of an effect on adolescent birthrates both in aggregate, and for racial and ethnic subgroups. Using the data described in this paper and the method of analysis described in this paper, my analysis also does not find sufficient evidence of statistically significant heterogeneity in the lack of an effect of the policy change on adolescent birth rates.

Summary

Overall, this project sought to identify the causal impact of a policy change to sex education (abstinence-only to comprehensive sex education) on both education and health outcomes. This study also sought to investigate whether or not the effects of the policy change impacted subgroups the same or differently. The empirical analysis, however, does not provide sufficient evidence that the policy change to sex education impacted either health or education outcomes. This was a surprising finding to me with respect to adolescent birth rates. I was less surprised to find no effect on female graduation rates in Iowa, as this was a secondary possible effect. However, given that comprehensive sex education is known to be more effective at reducing adolescent sexual risk-taking than abstinence-only sex education (see Chapter 2, starting at p. 29), I did expect to see some effect on teen birth rates in a state that switched from abstinence-only to comprehensive sex education. This project, though, sought to investigate a link between comprehensive sex education and the aggregate outcome of birth rates. While previous literature reveals that comprehensive sex education reduces sexual risk-taking behaviors, my findings do not support the idea that behavioral changes translate into overall aggregate outcomes. That is, while comprehensive sex education has impacts on behaviors, the

relationship between comprehensive sex education and adolescent birth rates is much more complex. The implications of finding no statistically significant effect on adolescent birth rates are discussed in the following section.

Implications

I turn now the implications of this study in terms of the effects of a policy change to enact comprehensive sex education. I also provide a discussion of the implications for using the synthetic control method for examining education data.

Findings

As stated previously, using the data described in this paper and the method of analysis described in this paper I do not find sufficient evidence of an effect of a policy change to sex education on adolescent birth rates. Though previous studies *do* find evidence that comprehensive sex education impacts sexual risk-taking behaviors, my findings do not provide sufficient evidence that, even though sex education might bring about changes in behavior, it may not actually decrease adolescent birth rates[27]. However, I do not analyze pregnancy rates or abortion rates, and there may exist a positive effect on this measure that is as yet uncovered. One implication of this finding is that research is needed to investigate if there other interventions better for helping reduce adolescent birth rates. Future research will require a much more in-depth, approach to understanding the drivers behind adolescent childbearing. This is deeply related to the question of causation – do teen births lead to future generations in poverty, or are

[27] See Lindberg & Maddow-Zimet, 2012; Isely et al, 2010, Mueller et al, 2008, and Erkut et al, 2013 for empirical evidence that sex education reduces sexual risk-taking behaviors among adolescents.

teen births a response to persistent poverty and institutional racism?[28] Both rigorous, quantifiable causal research and exploratory qualitative research are needed to begin to address this complex social phenomenon.

Additionally, the research community has not reached a consensus on the causal path of racial and ethnic minority adolescent pregnancy and childbirth. This lack of consensus reveals a need for further investigation while also calling into question the societal impetus to solve the "teen pregnancy problem" among racial and ethnic minority adolescents. For example, even though adolescent birth rates for Blacks are significantly higher than for Whites, the overall number of Black adolescent girls is so much lower than that of Whites that the majority of teen births are still overwhelmingly by Whites. This is important to consider when evaluating other possible interventions that are targeted specifically to reduce adolescent birth rates among racial and ethnic minorities. I return to this topic later in Chapter 5 in my discussion of high school completion and teenage pregnancy and childbirth.

This project contributes to the body of knowledge about the subject of adolescent birth rates by demonstrating that changing sex education policy (to make it comprehensive rather than abstinence-only) does not impact adolescent birth rates at scale. That is, with more precise estimates at the individual-level, analysts *may* be able to detect a reduction in adolescent birthrates among cohorts, or within geographic clusters such as neighborhoods, cities, or school districts. However, on average, a state policy change to adopt comprehensive sex education does not reduce adolescent birth rates. This may not be true for specific geographic clusters or individuals, however, that cannot be determined without individual-level data on sex education

---

[28] Refer back to Figures 1 and 2.

and birth rates over time. To date, no such data is available on individual receipt of sex education by type across a panel of years for numerous states, making inference about the overall, statewide effect of a state-level policy the best information currently accessible[29].

Additionally, my research questions sought to lay the foundation to explore the relationship between sex education and overall educational attainment. While I find no impact of a policy change to sex education on graduation rates, this finding is important in what it tells us about the relationship between health-related interventions and educational outcomes. In this analysis, with the data and methods of analysis used, I do not find a secondary effect on education as measured by graduation rates from the policy change in Iowa. While I find no evidence of an effect on graduation, using other data with other methods, future researchers may find an effect on graduation rates or another education outcome measure.

While any effect on graduation rates in Iowa could have been mediated by adolescent birth rates, this analysis, finding no effect on graduation rates using the data and method described, suggests that adopting comprehensive sex education does not lead to increased educational attainment through decreases in birth rates. This highlights the importance of fully understanding the causal impact of health-related interventions on the more proximate health outcomes before examining more distal outcomes. I return to this topic later in Chapter 5 in my discussion of whole-child education reforms.

---

[29] Kearney & Levine (2012a) also provide an econometric analysis using fixed effects to demonstrate that funding for abstinence-education, or the presence of mandatory sex education, do not impact teen birth rates. However, they do not distinguish between abstinence-only, abstinence-plus, or comprehensive types of sex education, nor do they examine the impact of a policy change to sex education, whereas this study focuses on the impact of a sex education policy *change*.

Methods

In addition to implications stemming from the findings of this study, there are also some important factors that this study uncovered with regards to the synthetic control method. Using a synthetic control to examine educational outcomes proved complicated. One of the major challenges was the lack of precise data for every state, for all 18 years. While data is available from the Common Core of Data ("Common Core of Data," 2015), it is not consistently organized across all years. Because of the de-centralized nature of the public education system in the United States, however, no other comparable measure of academic attainment was available.

Additionally, the synthetic control method is itself focused on comparing units, using a weighting system to statistically derive a control state that is numerically similar to the treatment state on observable characteristics. However, given that public education is regulated by the states, there is wide variation between states with regards to curriculum and graduation requirements. Using the synthetic control forces the researcher to assume that graduating from a school in Alabama is roughly the same as graduating from a school in Maine or California, both in rigor and content as well as the economic returns to a diploma from Alabama versus Maine or California. I find this to be an inherent flaw in using graduation rates as a measure of educational outcomes for comparing the states, and therefore in using the synthetic control method with graduation rates.

While the compilation of graduation rates and dropout rates by the federal government is improving, with the most current years providing a cohort-based graduation rate, the synthetic control method necessitates a long period of time. I utilized 18 years of data for this study;

however, an even longer period of time would have been desirable to more closely match variables from the donor states to Iowa.[30] So, even though the data collected have improved overall, it will be a long time before enough years of data are available to substantially improve the precision of the synthetic control method for use in determining impacts on graduation rates.

Even though graduation rates are a rough measure for modeling academic attainment, and they are not consistently reported by the Common Core of Data ("Common Core of Data," 2015), they are at least something by which we can examine what is going on in schools in response to policy decisions.[31] Graduation rates allow us to do the important work of discovering what policies, at the state-level, are effective at changing aggregate student outcomes. NAEP scores, because they come from a nation-wide normed test, provide a more precise comparison between the states. However, NAEP assessments are only administered every 4 years, and thus do not provide enough data construct a synthetic control.

In contrast to this, data from the Centers for Disease Control and Prevention (CDC) on all births in the United States were available consistently for the years included in this study. Overall, the synthetic control method performed better for the analysis of birth rates than for my analysis of graduation rates; the data exhibit significantly less volatility.

Using the synthetic control method for comparative case studies to analyze education outcomes in this project brought to light the necessity of high quality data that are available for substantial amounts of time. The synthetic control method is "data-hungry," requiring very large

---

[30] Abadie et al (2010) and Abadie et al (2014) use approximately 30 years of data. Cunningham & Shah (2014) use 25 years of data for one outcome, and 50 years of data for another outcome of interest.

[31] See Chapter 3 for further discussion of the necessity of using graduation rates as an education measure for between-state comparisons.

numbers of years of observations for accurate modeling. However, this "data-hunger" is mitigated by the increased precision that the method offers for comparative policy analysis. The synthetic control method, as it is used in this project, reminds us that education data in the United States that is available for cross-case comparisons between states is limited, and that it is important to continue working to ensure high-quality data are available at the national level to enable researchers to further investigate effects of education policies on aggregate student outcomes.

Discussion

I turn now to a discussion of relevant topics from Chapter 2 in light of the findings from this study.

Feminism

This study examines the effects of reforming sex education to make it comprehensive (rather than abstinence-plus), and is therefore deeply concerned with the proper content of sex education curriculum. My main question was whether or not the policy change to sex education would lead to improved health outcomes (a reduction in adolescent birth rates) as well as improved educational outcomes (an increase in high school graduation rates). Given the results of my findings, it seems that the content of sex education, in regards to abstinence education or contraception information, does not impact adolescent birth rates. This finding is important as it opens up a previously foreclosed space for thinking through the role of sex and sexuality education, and the purpose of these programs in schools. When discourse around sex education is chiefly concerned with changing behaviors to produce health outcomes, there is little space for

discussion of other possibilities for sex education or of moral and ethical reasons for providing sex education in schools[32].

Feminism's longstanding advocacy for women's rights to their own bodies and reproduction comes to mind in thinking through the content of sex education. Feminist thinking would logically lead to advocacy for comprehensive sex education (over abstinence-only sex education) because it includes information on the biology of conception, reproduction, and contraception – thus providing students with information about their own bodies.

Sex education, and the debates about which type of sex education is appropriate in schools, is deeply entwined with knowledge and power – both the power *of knowledge* around sex and sexuality and the power *to provide or withhold* this same knowledge. Kristin Luker's (2007) work on the debates about what should and should not be covered in sex education reveals this notion of power with regards to knowledge as the underlying driver of the differences of opinions on the proper content of sex education. Sex education, as Luker (2007) describes it, occupies "the touchiest spot on the boundary between family and school" (p. 175). The debate about what should or should not be included in sex education is less about the actual content than about who has the right, responsibility and power to determine what information children receive about sex and sexuality, and when they receive it. Arguments about the content of sex education, then, cover over the underlying debate about the role of the school to establish cultural values[33].

---

[32] Ample moral and ethical reasons have been circulated for *not* providing sex education in schools and have contributed to a lengthy period of abstinence-only education in the United States (see Lord (2010) for a historical overview of the content of sex education in the United States).

[33] For a more thorough consideration of the debates around the proper content of sex education, see Pillard (2007), Rose (2005), and Tapia (2005) as cited in Chapter 2.

This study, in finding no effect on adolescent birth rates in Iowa using the data and methods of analysis described in the study, brings some clarity to what functions sex education does and does not perform. This study suggests that strictly health-related effects (lowered birth rates) are not brought about by sex education alone. However, sex education *does* function in the role of establishing cultural values and norms. For example, comprehensive sex education, by providing what is thought to be a medically-focused (and therefore allegedly "morality-free") curriculum, actually reinforces cultural norms that support women's rights to know about their reproductive systems and to be active agents in their own sexuality (i.e. the right to use and require their partner to use contraception, the right to actively delay childbirth until later in life, etc.). An alternative example of sex education establishing cultural norms is found in abstinence-only education, wherein the value of chastity is promoted openly.

In thinking through the role of sex education as it relates to power, I revisit Foucault's (1971) notion of speech as power[34]. I turn now to a brief consideration of feminist discussions of the contents of sex education. The speech act – what can and cannot be said, what is said and what is unsaid – is an essential aspect of debates around sex education. Luker (2007) reports hearing from parents in her ethnographic study the "quintessentially Foucaultian point that information about sex profoundly changes the experience of sex" (p. 201).

Gilbert (2014) further highlights the concept of the speech act as power with regards to sex education in her discussion of the inclusion of LGBT issues in the curriculum:

> ...talk about sex in schools is fraught; leaning on discourses of the battered child, all talk about sex has the potential to be understood as a sexual act itself and, therefore, a

---

[34] Initial discussion of Foucault, speech and silence, and the content of sex education can be found in Chapter 2, p.24-26.

> violation of childhood innocence – especially talk about homosexuality. The conservative worry is that when queer adults talk with youth about their experiences, they do more than counsel or listen; they molest. 'Sexual speech itself enacts an emotionally abusive kind of sex;' is is 'a rape or molestation of the mind' (Irvine (2000)...p. 69, as cited in Gilbert 2014).

It was in this same vein that as recently as 1994 the Surgeon General was fired for suggesting that masturbation be included in the sex education curriculum (Lord, 2010). The act of even speaking about masturbation proved too much for the public to handle in 1994.

Britzman (1998) suggests that there is a lack of models for thinking about sex education, classifying the dominant models into three overarching categories: normal, using a normative physiological and psychological theory of adolescence; critical, viewing adolescence as a social construction rather than a problem of identity; and an un-named model, one that is un-named because it is not yet tolerated, and is not tolerated because it refuses to conceptualize sexuality as reducible to either biology or identity. I would locate the Surgeon General's ideas as well as Gilbert's (2014) call to include discussions of LGBT issues in sex education into the as-yet un-tolerated third category.

In the context of abstinence-only, abstinence-plus, and comprehensive sex education, Britsman's (1993) classification is useful. Comprehensive sex education takes a specifically medical or biological approach, whereas abstinence-focused sex education takes an identity approach, situating sexuality as immoral and moral in different contexts. Refusing to reduce sexuality to either biology or identity might result in a sex education curriculum that neither moralizes nor trivializes emotional aspects of sexuality. That is, abstinence-only sex education moralizes sexuality while comprehensive sex education often ignores the emotional aspects of sexuality.

Gilbert (2014) points out that "Sex education is steeped in the language of risks: risk groups, risk behaviors, risk reduction, at-risk populations" (p. 37). This discourse of risk serves to unify all three types of sex education under the assumption "that sexuality is a risk against which education mitigates" (Gilbert, 2014, p. 65). Gilbert goes on to explain that this assumptive undergirding means that, "At its most anxious, whether abstinence-only or comprehensive, sex education demands compliance" (p. 65), a Foucaultian notion indeed (see Foucault, 1971). This critique of sex education is shared by Jessica Fields (2008) who notes that "Sex education exists only because the situation with youth is so dire as to require it, and not because of a commitment to what sex education might positively accomplish" (p.13). A sex education curriculum that was not constructed as an antidote to risk and did not reduce sexuality to either biology or identity would be a radical step away from even the most progressive forms of sex education currently used.

This study, finding no effect from changing the curriculum to comprehensive sex education, along with feminist thought, can direct us to look forward and to ask critical questions around the nature of sex education in public schools such as: What outcomes might we expect from sex education that embraced sexuality as a natural, human right? Sex education that was fully inclusive of LBGT people? Sex education that more fully encompassed the specific needs of racial and ethnic minority students? The findings of this study show that a policy change to sex education to make it comprehensive is not enough to impact adolescent birth rates, and has no impact on educational attainment. In conjunction with this finding, feminist thought can further enable us to move beyond comprehensive sex education, and to imagine forms of sex education that might: (1) better address the health and social-emotional needs of all students and

(2) provide students access to information about their own bodies and sexuality as knowledge to which they ought to have a fundamental right.

This study not only works to address feminist concerns, but it is also in line with Sprague's (2005) call for quantitative feminist research to work to empower those marginalized by society not through direct action (such as some qualitative methods – for example, participatory action research -- might), but instead through asking important gender questions, and to exercise more influence on decision-makers in order to "make social research really count for large numbers of people" (p. 117). I imagine this extension, maintaining core feminist goals while opening up space for scholarship to expand and thrive, as feminist critical policy analysis 2.0 -- not a radical revision of feminist critical policy analysis, but rather an extension that can re-invigorate feminist scholarship around social policies. I return to a more thorough discussion of feminist critical policy analysis at the end of this chapter.

Whole-Child Reform Movements

In light of my findings, I discuss the implications for other whole-child based school reforms, considering again that sex education can be understood as a form of whole-child school reform in that it addresses needs other than academic achievement. As discussed in Chapter 2, whole-child school reforms operate along the same logic underlying the causal model I hypothesized in Figure 4: that it is necessary to improve health in order to improve education. The review of the literature provided in Chapter 2 suggests that wrap-around services and health services outside of school have little impact on educational outcomes, but that whole-child approaches work best when located within schools. My study explores a health curriculum (sex education) within schools, placing it within the bounds of what is believed to be the most effective way to implement whole-child reforms. My findings, though, suggest no impact on

either health or education. The implication for other whole-child reforms, even those situated within schools, is that it is important to have a clear understanding of the mechanisms by which specific health attributes are related to education, along with sufficient research showing that the health measure the proposed intervention seeks to address is causally linked to improvements in educational outcomes.

High School Completion and Teenage Pregnancy & Childbirth

I return now to the topic of high school graduation and teen pregnancy and childbirth. In Chapter 2, I offered a review of the literature around the relationship between teen pregnancy and childbirth and high school completion.

Birth rates as mediating variable. In my previous discussion of the relationship between teenage pregnancy and childbirth and high school completion, I offered two different theoretical models for understanding this relationship (see Figures 1 and 2 in Chapter 2). While this study does not, and cannot with the data at hand, fully investigate this relationship in order to parse out the endogeneity of high school completion and teenage pregnancy and childbirth, it can offer some insight into this. The findings presented in Chapter 4 show no impact of the policy change to sex education on adolescent birth rates or on female graduation rates. Additionally, the fixed effects estimation used for a robustness check shows no significant relationship between adolescent birth rates and high school graduation rates for female students, by racial and ethnic subgroup (see Tables 32 and 33).

On the one hand, following the conceptual model shown in Figure 1, there is substantial evidence that failure to graduate from high school for a teen mother results in a higher likelihood that her child will also drop out (see discussion in Chapter 2; Reardon, 2011, Kearney & Levine, 2012b; and Meade, Kershaw, & Ickovics, 2008). On the other hand, previous research (see

Marcotte, 2013 and Edin & Kefalas, 2005 as cited in Chapter 2) has also found evidence to suggest that the causal effect of dropout on birth rates for some adolescents may be endogenous, with mutual causation between dropping out and teenage childbirth, following the conceptual model shown in Figure 2. In line with the conceptual model shown in Figure 2, Kearney & Levine (2012b) find that teen childbearing has very little if any direct negative economic consequences, suggesting that elevated adolescent birth rates are associated with an already very low economic trajectory.

Another interpretation of this is that higher adolescent birth rates among racial and ethnic minorities represent a form of agency wherein racial and ethnic minority adolescents resist conditions of systematic inequality and poverty through defiance of middle class norms. This perspective requires that we view racial and ethnic minority female adolescents as agential subjects, acting in defiance to the intersecting systems of oppression via race and social class[35]. Government intervention into sexual moral codes, historically, has been based on White, middle class norms. Odem's (1995) history of late nineteenth century and early twentieth century government involvement in female adolescent sexuality highlights this longstanding tendency:

> Reformers assumed the authority to define an appropriate code of morality for female youth, one that was based on middle-class ideals of female sexual restraint and modesty. Young women who did not conform to these ideals were considered wayward and in need of control and rehabilitation by the state (p. 4).

Fully investigating a perspective that views persistent high adolescent birth rates as acts of resistance is beyond the purview of this study; however, further insight into this perspective can

---

[35] See Petchesky (1990) and Fine (2003a) for feminist discussion of female sexual agency in Chapter 2.

be gained from examining my findings with the lens of Black feminist thought. I now turn to a discussion of my findings as understood with this theoretical underpinning.

Using Black feminist thought to understand the lack of effect on birth rates. The empirical analysis shows no impact of a policy change to sex education to make it comprehensive on adolescent birth rates. In trying to understand my finding of insufficient evidence of an effect of the policy change on adolescent birth rates in Iowa, I turn to Collins (2000) theory of Black feminist thought as critical social theory to unpack the persistently higher adolescent birth rates of racial and ethnic minority girls. Collins defines and defends Black feminism, stating:

> Black feminism remains important because U.S. Black women constitute an oppressed group. As a collectivity, U.S. Black women participate in a *dialectical* relationship linking African-American women's oppression and activism...As long as Black women's subordination within intersecting oppressions of race, class, gender, sexuality, and nation persist, Black feminism as an activist response to that oppression will remain needed (p.24).

Drawing on this theoretical lens, we ought not to assume that a policy directed at all adolescents will be appropriate or effective for all subgroups. When understood through the lens of Black feminist theory, Black adolescent females are situated uniquely within intersecting oppressions. While understanding persistent higher Black, adolescent birth rates using Black feminism is not the same as understanding persistently higher Hispanic, adolescent birth rates, I suggest that this discussion can provide a framework for understanding this phenomenon across racial and ethnic minorities.

I present a discussion of the concept of a "culture of poverty" (see Figure 1) with regards to adolescent birth rates in Chapter 2. I also provide discussion of an alternative view of adolescent birth rates (see Figure 2), drawn from ethnographic understandings of teen pregnancy

and childbirth. In light of my findings, I return now to this discussion to explore further the differences between the two perspectives. In doing so, I draw on the work of Kaplan (1997) who conducted an in-depth, ethnographic study of Black, adolescent mothers to gain further insight into lived realities of Black adolescents who become mothers. I draw on this ethnography for sense making of my findings and understanding different frameworks for thinking through possible reasons why there is no effect on adolescent birth rates found in this analysis of a policy change in Iowa, using the data and methods of analysis described.

Kaplan (1997) provides an overview of the dominant theories around Black, teenage childbearing, grouping them thematically into the following categories: the culture of poverty perspective, the economic determinist perspective, the cultural strategies perspective, and the gender, race, and class perspective. From the work of Lewis (1966) and Moynihan (1967), the perspective of cultural poverty places the blame for Black teen pregnancy on the teens themselves, alleging that Black adolescent girls have lax moral values. This perspective views economic circumstances as a result of early motherhood, and does not consider economic circumstances to be a cause of early motherhood. The culture of poverty perspective on Black, teenage childbearing references the framework shown in Chapter 2 (see Figure 1).

An alternative to this perspective is the economic determinist perspective, theorized by Wilson (2012). This perspective draws on theories of social reproduction (Bourdieu, 1977) suggesting that structural aspects of the economic system (chiefly the transition from an industrial economy to a service economy) systematically, negatively impacted Black families, and that these negative impacts have created structurally embedded obstacles to improving one's economic conditions in the Black community (Wilson, 2012). Kaplan (1997) describes this perspective, writing, "people's sense of their lives is mitigated by their structural circumstances"

(p. 6). An example salient to this research project comes from Dash's (1986) study of Black, teenage mothers in Washington, D.C. Dash's (1986) research revealed that the teenage mothers he studied knew about birth control, but did not choose to use it, believing that motherhood was the only positive role available to them in their future. This is an economic determinist perspective – a closing off of possibilities due to the unremitting poverty in which many racial and ethnic minority adolescents live. This perspective more closely resembles the paradigm shown in Figure 2.

A third dominant mode of thinking about Black, teenage childbearing is the cultural strategies perspective. Kaplan (1997) discusses Stack's (1975) ethnographic research on the Black family, this perspective suggests that "child getting and keeping" are part of a larger set of survival strategies that have developed "as part of a unique Black culture" (p. 62-89). This paradigm is more closely aligned with the conceptual model presented in Figure 1 and discussed in Chapter 2. A strong contradiction to this perspective is a gender, race, and class perspective that views teenage childbearing not as part of a unique culture, but rather as "an outcome of gender, racial, and economic inequalities" (Kaplan, 1997, p. 8). In fact, Kaplan directly refutes this perspective, stating,

> ...when people accuse the Black community of condoning teenage pregnancy. It is just not true. Pregnant teenage girls were considered deviants in the past and are still considered so today by many in the Black community (p. 12).

This contradicts dominant assumptions about Black teenage childbearing and disrupts narratives that suggest cultural norms in the Black community are different from the majority of Americans.

By neglecting gender as an important factor, Wilson (2012) and Stack (1975) fail to take into account that Black teenage mothers' experiences are defined not just by race and class, but

also by gender – including gendered stereotypes as well as gendered experiences of adolescence itself. Gilligan (1990) endeavors to explore how adolescent girls experience self-development and coming of age, yet fails to address how race and economic factors direct girls' experiences. Kaplan (1997) suggests that what is needed is a combination of these perspectives that will enable us to learn "how problems associated with race, such as living in a racially segregated community where many adolescents find being part of a gang their only satisfying activity they have at their age, can condition girls' adolescent experiences" (p. 9-10).

Collins' (2000) theories of Black feminism concur with Kaplan's (1997) suggestion that Black motherhood – at any age – is complex. Collins (2000) describes it as "a series of constantly renegotiated relationships" (p. 176), going on to further elaborate:

> Ongoing tensions characterize efforts to mold the institution of Black motherhood to benefit intersecting oppressions of race, gender, class, sexuality, and nation and efforts by African-American women to define and value our own experiences with motherhood. The controlling images of the mammy, the matriarch, and the welfare mother and the practices they justify are designed to oppress (p. 176).

Through the lens of Black feminism, we see the zeal to solve the problem of Black, teenage childbearing as partaking in efforts "to mold the institution of Black motherhood to benefit intersecting oppressions."

Indeed there is a legacy of dubious relations between government programs in the area of reproductive health and the Black community that have led to suspicion and hostility[36]. The Tuskegee Syphilis Experiment was begun in the 1930s by the Public Health Service to study the

---

[36] This discussion is not intended for generalization to other racial and ethnic minorities, but instead to provide a framework for understanding adolescent birth rates for other racial and ethnic minorities. Specifically, the legacy of slavery further in this discussion is particular to the Black community and not generalizable to any other racial or ethnic minority in the U.S.

effects of untreated syphilis in African-American men; no new treatments were tested nor was the efficacy of old treatments tested (Jones, 1993)[37]. The Tuskegee Syphilis Experiment, while perhaps the most infamous case of racially-based mistreatment in the area of medicine, is not the only one. An excerpt from the *New York Times* bestseller *The Immortal Life of Henrietta Lacks* offers a glimpse into the world of medicine that Black Americans encountered for most of the 20th century:

> Like many doctors of his era, TeLinde often used patients from the public wards for research, usually without their knowledge. Many scientists believed that since patients were treated for free in the public wards, it was fair to use them as research subjects as a form of payment. And as Howard Jones once wrote, "Hopkins, with its large indigent black population, had no dearth of *clinical material* [emphasis added]" (Skloot, 2011, pp. 29–30).

The public revelation of the Tuskegee Syphilis Experiment in 1972, along with decades of institutional racism embedded in the healthcare system, contributed to the distrust of future generations of Black Americans in government health programs (Lord, 2010). Sex education, implemented in public schools, may be seen as another governmental program in this same vein.

Going back only a little further in history, one must address the legacy of slavery with regards to Black motherhood. Through the lens of critical race theory, we understand that whiteness constitutes a form of property – the property of the self (Harris, 1993). In thinking through the persistence of higher rates of childbirth among Black adolescents over those of

---

[37] Throughout the study the participants were misled about the purpose of the study as well as their own health status. The Public Health Service denied adequate treatment for syphilis to subjects during the 1930s, and when penicillin was discovered to swiftly cure the disease, it was withheld from the men as well. None of the men in the study have informed consent, and the experiments remains one of the most egregious examples of researcher misconduct and ethical violations in American history (Jones, 1993).

Whites, it is impossible to ignore the historical legacy of slavery, under which Black mothers did not have property rights to themselves or the children they bore[38].

Furthermore, critical race theory also provides an important perspective on understanding educational inequities based on race (Ladson-Billings, 1998), pointing out ways in which race continues to be a systematic factor in education. When we consider the perspective of critical race theory with Black feminism, Black motherhood at any age takes on meaning that is conflicted. Under the system of slavery Black mothers did not hold property in themselves or their children, and caretaking was often shared by the community in what Collins (2000) terms "bloodmothers, othermothers, and a woman-centered network" that persisted post-slavery. However, the tenuous continued existence of a woman-centered network that embraces child-raising as a community endeavor does not mean that Black teenage childbearing is supported by mothers of teenage girls or other adults in the community. Yet Collins (2000) points out how the values of White, middle class America present a barrier to social mobility for Black Americans:

> In some fundamental ways, moving into the middle class means adopting the values and lifestyles of White middle-class families. While the traditional family ideal is not the norm, the relative isolation of such families from others is noteworthy. U.S. middle-class family life is based on privatization – buying a big house so that one need not cooperate with one's neighbors, or even see them (p. 182).

This is antithetical to a communal history of child-rearing and family interaction. In this sense, the lives of matriarchal families in poor, Black communities are viewed as deviant from White, middle-class America. It is from this perspective that a culture of poverty theory of Black, teenage childbearing evolves.

---

[38] See discussion in Chapter 1 and Luker (2007) regarding historical criminality of female unchastity as a violation of property rights.

Using the lens of Black, feminism along with critical race theory allows us to interrogate the phenomenon of adolescent birth rates that are persistently higher for racial and ethnic minorities. This study demonstrates that comprehensive sex education, as a policy enacted to decrease teen pregnancy and childbirth, does not impact adolescent birth rates. Using Black, feminist theory helps to begin thinking through the paradigm that views persistently higher adolescent birth rates as agential and resistant to White, middle-class values. In using this theoretical lens in conjunction with my empirical findings, I suggest that of the two conceptual models presented here (Figures 1 & 2), persistently higher adolescent birth rates among racial and ethnic minorities is likely more closely aligned to Figure 2. Rather than working on strategies such as comprehensive sex education (which my findings suggest are ineffective at reducing adolescent birth rates) to break the cycle of poverty, Black feminist thought leads us to instead focus on changing the hard, flat line of poverty as shown in Figure 2. In this conceptual framework, poverty is represented as unremitting, with little chance of upward social mobility, regardless of one's age at the time of childbirth. Figure 1, on the other hand, assumes a possible upward mobility for those in poverty that is stopped because of an adolescent childbirth. Black feminism reminds us that poverty disproportionately affects racial and ethnic minorities, and that there are historical complexities associated with childbirth and reproduction. While adolescent birth rates for Whites are proportionally lower than those of racial and ethnic minorities, perhaps this is because there are fewer Whites proportionally in poverty. Using Black feminism to interpret the findings of this study thus opens up a different direction for policy action – one that extends beyond the simplistic idea of providing information on contraception to reduce teen pregnancy and childbirth rates.

Latina / Latino critical theory. While feminist critical policy analysis seeks to be inclusive of black feminist thought, Latina/o critical theory, and other feminism, it is still useful to think through Hispanic adolescent birth rates separately, using the lens of Latina/o critical theory. Many associate the advent of Latina/o critical theory with Rodolfo Acuña's (2015) book *Occupied America* that charted new territory in taking into account U.S. colonialism as it relates to Mexico and how it continues to impact the lives of Chicanos living in the U.S. today. Latina/o critical theory developed out of this new mode of thinking through the issues facing the Latina/o community by law professors who, drawing on the tenets and practices of critical race theory (CRT), began writing articles and engaging in scholarship that followed critical race theory with a specific focus on Latina/o experiences (Stefancic, 1997). In her annotated bibliography of Latina/o critical theory, that is still much used today, Stefancic (1997) denotes several important themes within Latina/o critical theory including the following:

> "*Critique of liberalism*. Many Latino/a writers argue, expressly or implicitly, that liberalism fails to address the Latino condition. Other authors target a mainstay of liberal jurisprudence such as neutrality, objectivity, color blindness, or the inability to address group-based harms.
> *Intersectionality*. ...Latinas focus particularly on another multiple oppression, stemming from being excluded from the women's movement and its agendas, as well as having to use color-based remedies based on the needs of African-American women.
> *Gender discrimination*. Though gender discrimination is common to all women, some writers focus on a form particular but not unique to Latino culture – *machismo* (exaggerated masculinity)" (p. 425-426).

These themes are in line with the tenets of feminist critical policy analysis and Black feminist thought; however, Latina/o critical theory differs in some important ways. Broadly, CRT and LatCrit both "explore the ways that so-called race-neutral laws and policies perpetuate racial and/or ethnic and gender subordination" (Bernal, 2002, p. 108). However, LatCrit focuses on a "progressive sense of a coalitional Latina/Latino pan-ethnicity" (Bernal, 2002, p. 108; Valdes,

1996). Using LatCrit to think through the implications of persistently higher adolescent birth rates for Hispanic girls enables us to address the multidimensional identities of these girls, along with the intersectional forms of oppression they encounter.

Similar to the questions of agential responses to persistent poverty that Black feminist thought raises, LatCrit leads us to think through the lived experiences of Hispanic adolescent girls and how those experiences intersect with policies and programs that are thought to reduce teen pregnancy. In her study of the role of bodies in policy analysis, Wanda Pillow (2003) writes:

> "The teen pregnant body is a site of state regulation and control not only of the teen mother, but also a site for the regulation and reassertion of societal norms, morals and values on issues such as female sexuality, single-parenting, welfare, birth control and abortion. Teen pregnancy as an educational policy issue specifically challenges norms, morals and values around adolescent sexuality, female sexuality and sex education. The teen pregnant body has also proven to be a body that cannot be simply contained or fixed; it is excessive and leaky, not easily predicted or programmed for under traditional policy analysis" (p. 149).

Pillow (2003) uses feminist genealogy to trace discourses that impact how teen mothers are defined and framed. Pillow goes on to describe that, "This tracing links and makes obvious that in the US who we think the teen mother is, who she is depicted as, is integrally linked with what type of education we think this teen mother needs and deserves" (p. 151). Through the lens of LatCrit, we understand that this normative teen mother, if she is viewed as Hispanic, is likely not considered deserving of financial support from the state, nor of adequate education programs.

Hyams (2000) engages in understanding the unique situation of Hispanic teen girls in her study on the discourses of academic success among adolescent Latinas. Hyams (2000) finds that for adolescent Latinas, being a student is not an un-gendered time or life experience. Rather, it is a time that is "embedded in society's expectations of and anxieties about young women" (p. 635). That is, Latinas face a particularly complex web of social expectations wherein their academic success is deeply linked to their ability or willingness to maintain a bounded sexuality

that does not allow for any female desire or agency. For the young women Hyams (2000) interviewed, being a good student and being a sexual being at all were diametrically opposed. In this context, adolescent female sexuality is pathologized, forcing Latinas into dichotomized gendered subjectivities – either that of a good student, or that of a girlfriend or sexual being.

One important issue that Latina/o critical theory raises is that of agency. The concept of agency, in Butler's (2011) formulation, is found in ambivalent spaces within the matrix of hetero-patriarchal power relations that agency often opposes. For Latinas pressed into the dichotomized gendered subjectivities described previously, a space for agency may exist in the choice to remain in one or the other category or in the choice to change from one to the other.

Latina/o critical theory also directs us to examine cultural issues that may relate to adolescent birth rates. For example, hearkening back to Hyams (2000) finding that Latina's often must choose between either having any sexuality *or* academic success, Mireles-Rios & Romo (2014) find a strong correlation between mothers' high expectations for academic success and delaying childbearing among adolescent Latinas as well as a strong association between academic orientation overall among adolescent Latinas and beliefs about early childbearing. Biggs et al (2010) find that wanting or ambivalence about teenage childbearing are associated with lack of or inconsistent use of birth control in addition to concerns about the side effects of contraceptive use and inadequate information about contraceptives for Latinas. Interestingly, Biggs et al (2010) also find that parental communication and values are deeply important to delaying childbearing among adolescent Latinas, referencing once again parental expectations regarding adolescent sexuality and academic success.

While cultural issues such as *machismo* and the ideation of motherhood are present in the Latina/o community, these issues, upon closer investigation, do not impact adolescent

childbearing in the ways that one might think(Aparicio, Pecukonis, & Zhou, 2014). Specifically, Lee & Hahm (2010) demonstrate that more acculturated Latinas who spoke English at home were more likely to have STDs and to exhibit sexual risk-taking behaviors than Latinas who were foreign born and who did not use English at home. This is an important finding when understood through the lens of Latina/o critical theory. While public discourses frame the teen mother, if she is Hispanic, as exhibiting pathological sexuality that is a byproduct of cultural values. However, empirical findings suggest that Latina/o culture actually reduces the likelihood of a teen pregnancy. This suggests that perhaps the acculturation process impacts Latinas in such a way that it leads to more sexual risk-taking behaviors, which then perhaps lead to increased birth rates. Returning to the original ideas behind LatCrit, this can be understood as a continued postcolonial impact on Hispanic peoples living in the United States.

In order to combat this impact, perhaps more culturally relevant programs and pedagogies are needed in the area of sex education. Pillow (2003) discusses the role of race in developing adequate school programs:

> "By ignoring and, thus, silencing issues of gender, race and female sexuality related to teen pregnancy, school-based programmes for teen mothers have remained entrenched in normative assumptions and moralistic ideology.
>
> Understanding how these silences are perpetuated and reproduced while at the same time women's sexuality is being constantly marketed and proliferated is crucial to developing effective school-based programmes for teen mothers" (p. 152).

That is, in order to better meet the needs of Hispanic adolescents regarding teen pregnancy and childbearing, education programs must exhibit an understanding of diverse cultures and must address issues of race and female sexuality. Wilkinson-Lee et al (2006) note that an important reason that many mainstream health programs have failed to mete the needs of Latino clients is because many non-Latino administrators, program planners, and service delivery staff lack the necessary cultural sensitivity for designing and implementing successful programs for Latinos.

Wilkinson-Lee et al (2006) draw on the concept of cultural sensitivity as a continuum ranging from cultural destructiveness to full cultural proficiency. Because my study does not endeavor to examine the cultural sensitivity of specific sex education curriculum used in Iowa, I can only speculate that increasing the cultural sensitivity of these programs may yield positive effects. However, using the lens of Latina/o critical theory, I suggest that the phenomenon of Hispanic adolescent birth rates is complex, and one that cannot be adequately addressed by simply improving the cultural sensitivity of sex education programs, as that would not address the role of acculturation or the legacy of US colonialism.

Education Gradient

As mentioned in Chapter 2, the extant literature around the education gradient is not clear; scholars have not yet reached a consensus on whether or not education leads to better health, good health leads to better education, or if both are reciprocally causal. My thinking at the start of this project was that *if* I found a causal impact of sex education (bringing about increased graduation rates and lower teenage birth rates), that perhaps that finding could be, eventually, extrapolated out to examine the impacts of such a policy change on the overall education gradient gap. Elo & Preston (1996), in their investigation of the education gradient, note their finding of a "mortality penalty associated with being black" (.56). If reforms to a health policy that is related to schools, such as sex education, could positively impact both health and education, and could possibly help racial and ethnic minority students more than White students, then the implications could be that these kinds of policies – health related, but implemented in schools – could be a powerful way to diminish the "mortality penalty" that Elo & Preston (1996) found. However, my findings reveal that a policy change to sex education to make it comprehensive does not impact adolescent birth rates or female graduation rates. This

does not support the hypothesis that health policies in schools could begin to reduce the education gradient gap. While I still believe that investigating determinants of the education gradient gap is important, it is clear that sex education is not among them.

Limitations, Implications for Future Research, and Concluding Discussion

Limitations

As previously discussed, one of the major limitations of this study is the quality of education data that is available to make comparisons between the states. Additionally though, this study is also limited by the lack of data regarding variation within states. That is, moving the analysis down one level (for example, examining graduation rates by district) could improve the precision of the estimates if it were possible also include information about the specific curriculum used by each district and fidelity of the districts to the state policy. Using the average graduation rates, even when disaggregated by race and gender, does not identify the variation between districts and schools (i.e. the graduation rates of Black, females is not likely to be the same at every high school in the state of Iowa). The type of analysis used in this study masks this variation.

While there is variation within the state with respect to data on educational attainment, there is also variation in implementation of the policy. Given the nature of schooling in the United States – that it is loosely coupled with a strong sense of localism – there was surely a great deal of variation between the school districts in Iowa, as well as between individual schools within districts, in the implementation of sex education. This study only provides information about overall responses to the policy change throughout the state, and does not attempt to account for the variance in implementation throughout the state.

Another limitation of this study is that it does not and cannot answer some important questions about sex education policy reform. For example, this study is not designed to answer what drives ethnic and racial minority adolescent birth rates or how childbearing relates to high school completion for racial and ethnic minority students. These are more complex questions that can be answered only with further and different analysis.[39]

Implications for Future Research

I turn now to the possibilities for future research on sex education, teen birth rates, and the education gradient. First, the investigation into the impact of sex education on health outcomes could be bolstered by investigating the impact of the policy change on health indicators other than birth rates. For example, it would be useful to understand the impact of sex education on Apgar scores of children born to adolescent mothers, the level of prenatal care received by adolescent mothers, and the overall health of pregnant teens during and after pregnancy. All of these data are available in the same files used for this analysis and could provide a more complete picture of the impact of sex education on health outcomes.

While this study finds insufficient evidence of an effect on adolescent birth rates, it does not attempt to study overall adolescent pregnancy rates. This type of analysis could provide insight into whether or not sex education impacts abortion rates. Another avenue for future research is a study of the impact of a policy change to sex education to make it comprehensive on adolescent sexually transmitted disease rates.

---

[39] Specifically, before a causal study of these issues can be done, qualitative inquiry is needed to begin locating the possible determinants and effective policy responses.

Additionally, an extension of this study might investigate the impact of high school completion on maternal health indicators. That is, for women ages 20-24, what is the impact of having graduated from high school (as opposed to dropping out or completing a GED) on health indicators such as Apgar scores of live births, level of prenatal care, and overall health during and after pregnancy? Exploring this relationship leads back to the question of the education gradient and the role of education on health, and how that is transmitted generationally. Additionally, this project might provide the structure for replicating a similar study of a different health policy in order to examine impacts on health and education.

Feminist Critical Policy Analysis

To bridge feminist critical policy analysis with econometric causal modeling seems fraught with inconsistencies. On the one hand, feminist critical policy analysis is chiefly concerned with the ways in which policies and institutions work to reify White, patriarchal power – a value-laden perspective (Marshall, 1997). On the other hand, traditional econometric analysis takes an objective, empirical approach to understanding the causal impacts of social policies. I suggest, however, that bringing the two together is a next step in the evolution of feminist work in social policy.

I return to Chapter 2 and my discussion of Pillow's (1997) feminist critical policy analysis of teen pregnancy and schooling[40]. Pillow finds, through ethnographic research, that a program designed to help the very type of student she encounters fails to do so. This is an example of deep understanding of the particular. My findings similarly examine an education intervention, and uncover that it does not do what it was designed to do. However, by analyzing

[40] Refer to p. 27-29 in Chapter 2 for a full description.

state-level data, I am able to draw conclusions about the efficacy of a policy change to sex education to make it comprehensive for many students rather than just a few. Without work such as Pillow's (1997), we would not know to look for this possibility. Yet without causal studies such as this one, we cannot know with any certainty that programs are or are not working on average and for whom.

Under the banner of Audre Lorde's famous quote "For the master's tools will never dismantle the master's house" (as cited in Marshall, 1997, p. 3), feminist critical policy analysis is a tool to decenter the power apparatus, to give voice to the voiceless, and to highlight gender inequities. I propose that Lorde's supplication for scholars to abandon the master's tools is applicable more to the theoretical than the empirical. Without new modes of thinking, we cannot think society anew– we cannot imagine a more socially just world. It is clear that using the master's tools will not allow us to think theoretically beyond the social norm. However, as the methods wars have abated somewhat in the field of education research, the trajectory of some methodological approaches has begun to render them less effective at bringing about change.

Given the establishment of the What Works Clearinghouse in 2002 by the Institute of Education (IES), along with its methodological requirements that permeate funding sources for education research, (Constantine, Ponza, Seftor, & Cody, 2013), we would be remiss to fail to take stock of the current situation for feminist critical policy analysis in the field of education. Can FCPA survive in this hostile environment if it precludes causal methods? A better question, perhaps, is can FCPA *thrive* in the future without opening itself up to an expanded understanding of what it means to do feminist policy scholarship? I agree with Sprague's (2005) criteria for critical feminist research: "what distinguishes critical from uncritical research is not the method used, but how the method is used, both technically and politically" (p. 27).

I also agree with Marshall's (1997) assertion that "Feminist critical policy analysis is ideological, centers on gender, states clear values base, an identifies the formal and informal processes of power and policy that affect women's and men's advancement and full development" (p. 2). I suggest that these goals and attributes are not necessarily diminished by the use of quantitative, econometric methods. This study demonstrates that the feminist critical policy scholar can avail herself of *all* tools necessary to explore policy issues relevant to feminist concerns. I use econometric methods to interrogate the effects of policy reform to sex education. I then use the findings from that analysis to highlight previous foreclosures of the possibilities for sex education that feminist scholars have previously bemoaned, but perhaps lacked empirical evidence with which to work to change the direction of discourse around the content and role of sex education. I suggest that the findings from my empirical analysis offer a way out of the closed possibilities of either abstinence-only, abstinence-plus, or comprehensive sex education. This is a feminist use of empirical research, based on Sprague's (2005) definition, both in content and in how I use the findings.

Feminist critical policy analysis has a commitment to understanding how power works through policies to reify systems of oppression. Marshall (1997) describes this writing, "Power is enacted by control of knowledge. Those who control the discourse discredit or marginalize other truths" (p. 6). My previous discussion of the speech-act as power with regards to sex education echoes this sentiment. I assert that in the current context, feminist scholars can gain more power over the discourses around gender issues generally only through an ability to speak back to the hegemonic center of scholarly research. A Foucaultian take on the role of speech as a power tool that can be used to block or create change can, in this sense, is therefore re-imagined to encompass more than an indictment of hegemonic discourses around sex education, and

adolescent sexual promiscuity. Instead, I use Foucault's (1971) understanding of the speech-power tool as a call to take charge of the dominant discourse, bringing to bear on it feminist perspectives and critiques. Under this Foucaultian theory of speech as power, by embracing the methods of normative policy analysis, I infuse my discourse with power – a strategy that builds on the ethos of responsibility of feminist critical policy analysis, extending that ethos to the reception and possible impact of FCPA scholarship.

One of the criticisms of quantitative policy analysis is a reliance on statistics that have historically exhibited gender bias (Folbre & Abel, 1989; Sprague, 2005). Understanding that race and gender are often situational and occur on a continuum[41] makes fixing these into discrete categories for statistical analysis problematic. Marshall (1997) highlights this, saying:

> Statisticians are fond of neat categories: by sex, age, socio-economic status (SES), and so on. Critical feminist analysis insists upon recognition of complexity – that the categories are mixed, have many elements that make up whole beings, and are not static but evolve (p. 21).

I suggest that while discrete categories *are* insufficient to fully encapsulate social experiences and lived realities, these categories exist nevertheless. That is, *someone* is counting by neat categories, and when identified under these categories, individuals experience differential outcomes from policies and education programs. It is the role of the feminist critical policy scholar to ask critical questions that seek to uncover systematic and structural inequalities. In order to get at structures, we must research large numbers of people, and we must find out what *causes* better outcomes for whom. This cannot be done with qualitative methods alone, which cannot investigate the causal impacts of policies.

---

[41] See Butler (2006) as discussed in Chapter 2, p.21-22.

Further, I agree with Sprague's (2005) assertion that "measurement is never independent of a standpoint, and historically the dominant standpoint has been a privileged one" (p. 88). While quantitative feminist critical policy analysis does not necessarily overcome the problem of a privileged standpoint, it can at least work to change the dominant standpoint to one that is less gender-biased.

I also agree with Sprague (2005) who writes, "Those who take the position that one class of methods is good and another is bad are committing the same logical error that conventional scholars do – they fail to distinguish among method, methodology, and epistemology" (p. 26), and that the distinctions between feminist qualitative work and feminist quantitative work are much less important than the similarities. This project offers an example of a quantitative approach to feminist critical policy analysis. I adhere to the tenets of feminist critical policy analysis in my choice of research question as well as in my interest in the impacts of a policy change to sex education on different subgroups of students. In these regards, I suggest that this study presents a useful application of feminist critical policy analysis.

TABLES

Table 1

Timeline of Pertinent Issues

1960's	Beginnings of second wave Feminism; "Our Bodies, Ourselves"
1980s	Public interest in teen pregnancy rates reaches critical levels
1981	Adolescent Family Life Act (AFLA) enacted
1989	Majority states mandate HIV/STD prevention Ed, 23 mandate Sex Ed
1991	Teen pregnancy rates peak[42]
1996	Title V, Section 510(b) passed, federal funding for abstinence-only Sex Ed with state matching requirements; all states except California accept funds; funding level is $50 million
2000	Community Based Abstinence Education (CBAE) federal funding for abstinence-only Sex Ed started, $20 million per year
2002	NCLB adopted; changes to school accountability and therefore possibly graduation requirements
2007	CBAE funding peaks at $113 million
2009	Congress eliminates most federal funding for abstinence-only Sex Ed
2010	Health Care Reform provides $75 million for evidence-based comprehensive Sex Ed; Title V also re-established with $50 million for abstinence-only Sex Ed

Notes: Information compiled from SIECUS, the Guttmacher Institute, and the U.S. Department of Education (*No Child Left Behind Act of 2001*, 2002a, *No Child Left Behind Act of 2001*, 2002b, "SIECUS - State Profiles," 2013)

[42] For a graphical representation of this see Appendix Figure 1.

Table 2

Summary of State Policies, 2012

No State-level Requirement to Teach Sexuality or HIV/STD Education	Required to Cover Contraception if Sex Education is Taught
Alaska	Arkansas
Arizona	California
Arkansas	Colorado
Florida	Delaware
Idaho	Dist. of Columbia
Louisiana	Hawaii
Massachusetts	Maine
Nebraska	Maryland
North Dakota	Missouri
	New Jersey
	New Mexico
	New York
	North Carolina
	Oregon
	South Carolina
	Tennessee
	Vermont
	Washington

Table 3

Typology of Sex Education State Policies	
Type	Description
Abstinence-only	Stresses abstinence until marriage; follows federally funded sex education (a)-(h) definition; no discussion of contraception
Abstinence-plus	Stresses abstinence but discussion of contraception is included, or *not* prohibited
Comprehensive	Focuses on medically accurate information on contraception and HIV/STD prevention; no emphasis on abstinence

Table 4

Policy Coding for Types of Sex Education		
Policy Code	Description	Category
1	Stresses abstinence until marriage; follows federally funded sex education (a)-(h) definition; no discussion of contraception	Abstinence-only Policy
2	Stresses abstinence but discussion of contraception is included, or *not* prohibited	Abstinence-plus Policy
3	Focuses on medically accurate information on contraception and HIV/STD prevention; no emphasis on abstinence	Comprehensive Policy

Table 5

Sex Education Changes, 2003-2009			
State	Year Policy Changed	Sex Ed Type: Before	Sex Ed Type: After
Hawaii	2008	abstinence-plus	comprehensive
Iowa	2005	**abstinence-only**	**comprehensive**
Kansas	2005	abstinence-only	abstinence-plus
North Carolina	2007	abstinence-only	abstinence-plus
Oklahoma	2004	abstinence-only	abstinence-plus
South Dakota	2008	no state policy	abstinence-plus
Tennessee	2008	abstinence-only	abstinence-plus

Table 6

Comparison of Iowa to U.S. Average				
	Iowa		U.S. Average	
Total Population	3,047,646.00		6,016,451.00	
Race / Ethnicity		Percentage		Percentage
White Alone	2,793,432.00	92%	4,460,206.00	74%
Black or African American Alone	88,664.00	3%	752,077.10	13%
Hispanic or Latino	151,027.00	5%	1,042,715.00	17%
Households with 1 or more people under age 18	376,074.00	12%	745,326.50	12%
Average household income *	$64,880.00		$70,264.52	
Households receiving public assistance	29,693.00	1%	61,590.04	1%
Civilian Population with No Health Insurance	262,227.00	9%	874,911.30	15%
Males 16 & over employed	809,597.00	27%	1,440,026.00	24%
Females 16 & over employed	747,734.00	25%	1,312,242.00	22%
Gini index of inequality	0.4299		0.4567615	

* Adjusted for inflation to 2012 dollars.

Table 7

States with Abstinence-only Sex Education and *no change* to the policy
Florida
Indiana
Michigan
Ohio
Pennsylvania
Utah

Table 8

States Without a State-level Policy on Sex Education and *no change* to the policy
Alaska
Arizona
Arkansas
Colorado
Idaho
Massachusetts
Mississippi
Montana
Nebraska
North Dakota
Texas
Virginia
Wisconsin

Table 9

Inflation adjustment conversion factors	
Year	Conversion Factor
1995	0.654
1996	0.674
1997	0.689
1998	0.700
1999	0.715
2000	0.739
2001	0.760
2002	0.772
2003	0.790
2004	0.811
2005	0.838
2006	0.865
2007	0.890
2008	0.924
2009	0.921
2010	0.936
2011	0.966
2012	0.986
2013	**1.000**

("Consumer Price Index (CPI)," n.d. & "Individual Year Conversion Factor College of Liberal Arts | Oregon State University," n.d.).[43]

[43] In order to convert per capita income for 1995-2012 to 2013 dollar values, the dollar amount from each year was divided by the conversion factor assigned to that year.

Table 10

States Included in Donor Pool
Alaska
Arizona
Arkansas
Colorado
Florida
Idaho
Indiana
Kentucky
Louisiana
Massachusetts
Michigan
Mississippi
Montana
Nebraska
North Dakota
Ohio
Pennsylvania
Texas
Utah
Virginia
Wisconsin

Table 11

Descriptive statistics: Adolescent birth rates							
Variable		Mean	Std. Dev.	Min	Max	Observations	
All subgroups, ages 15-19	overall	42.66715	13.24564	4.931445	80.19075	N =	396
	between		11.81118	22.23061	64.87798	n =	22
	within		6.476651	19.31257	58.29269	T =	18
White, ages 15-19	overall	31.14173	10.89047	6.188729	62.08065	N =	396
	between		9.840676	13.75709	52.08635	n =	22
	within		5.092277	18.96004	46.0345	T =	18
Black, ages 15-19	overall	67.57907	22.3454	0.6479355	136.3111	N =	396
	between		15.97831	39.50687	98.84273	n =	22
	within		15.96866	27.69534	114.555	T =	18
Hispanic, ages 15-19	overall	78.57985	25.21194	0.7077454	211.5942	N =	396
	between		16.14171	48.36747	103.6614	n =	22
	within		19.65453	14.54643	186.5127	T =	18

Notes: Descriptive statistics include Iowa. Birth rates calculated per 1,000.

Table 12

Descriptive statistics:
Graduation rates, by subgroup

Variable		Mean	Std. Dev.	Min	Max	Observations	
White	overall	0.9081951	0.0537856	0.56	0.9986582	N =	396
	between		0.0264507	0.8492114	0.9438791	n =	22
	within		0.0471525	0.5761697	1.055995	T =	18
White, male	overall	0.9083587	0.0540143	0.56	0.9993883	N =	396
	between		0.0264374	0.8450104	0.9443319	n =	22
	within		0.0474203	0.5762051	1.045429	T =	18
White, female	overall	0.9147303	0.0540318	0.56	0.9986583	N =	396
	between		0.0231186	0.8587523	0.9478058	n =	22
	within		0.0490711	0.5779671	1.041751	T =	18
Black	overall	0.8129449	0.0982915	0.4103943	0.9886613	N =	396
	between		0.0558559	0.6545025	0.9014313	n =	22
	within		0.0817044	0.4406348	0.9933524	T =	18
Black, male	overall	0.8142517	0.1035658	0.4103943	0.992658	N =	396
	between		0.0580625	0.6590731	0.897913	n =	22
	within		0.0866008	0.4389596	0.995613	T =	18
Black, female	overall	0.829256	0.1018086	0.4103943	0.9905344	N =	396
	between		0.0506566	0.6781075	0.9049497	n =	22
	within		0.0889345	0.4460065	1.003023	T =	18
Hispanic	overall	0.7922018	0.1008975	0.2664835	0.9916667	N =	396
	between		0.0556378	0.6293634	0.893439	n =	22
	within		0.0849587	0.3463745	1.000191	T =	18
Hispanic, male	overall	0.8005835	0.0986428	0.2664835	0.9916667	N =	396
	between		0.054441	0.6344762	0.898853	n =	22
	within		0.0830309	0.3447654	1.005198	T =	18
Hispanic, female	overall	0.8116789	0.1028415	0.2664835	0.9982361	N =	396
	between		0.0507463	0.6544222	0.9031868	n =	22
	within		0.0900667	0.3316426	1.049534	T =	18

Notes: Descriptive statistics include Iowa.

Table 13

Descriptive statistics:
Observable state characteristics averaged during pre-treatment time period

Variable		Mean	Std. Dev.	Min	Max	Observations	
Percent population in poverty	overall	13.13081	3.401803	8.1	23.8	N =	396
	between		3.103301	9.972222	20.18889	n =	22
	within		1.535013	9.825253	17.62525	T =	18
Percent population receiving food stamps	overall	0.0909074	0.0390377	0.0341834	0.2212199	N =	396
	between		0.0276819	0.0566394	0.1501309	n =	22
	within		0.0281182	0.0409361	0.1803895	T =	18
Annual unemployment rate	overall	5.417424	1.913529	2.3	13.5	N =	396
	between		1.041601	3.277778	7.1	n =	22
	within		1.619677	2.095202	11.8952	T =	18
Change in percentage Hispanic population	overall	0.0234347	0.0212448	-5.15E-06	0.09464	N =	396
	between		0.0142238	0.0072034	0.0525117	n =	22
	within		0.016054	-0.029077	0.0667844	T =	18
Change in percentage Black population	overall	0.0059752	0.0056051	-0.0027876	0.0243966	N =	396
	between		0.0034592	0.0001828	0.0125924	n =	22
	within		0.0044683	-0.0066172	0.0180668	T =	18
Inflation-adjusted per capita income	overall	38688.78	5726.129	26567.28	57518.25	N =	396
	between		4935.98	30771.06	51791	n =	22
	within		3077.862	29591.97	57125.1	T =	18
Gini inequality measure	overall	0.5890361	0.0357065	0.5287119	0.7114248	N =	396
	between		0.0241813	0.5491603	0.6500484	n =	22
	within		0.0267467	0.5326361	0.6898721	T =	18

Notes: Descriptive statistics include Iowa. Birth rates calculated per 1,000.

Table 10

Change in percentage Hispanic population, 1995-2012						
	Iowa		All other states		Donor states	
	Percentiles	*Smallest*	*Percentiles*	*Smallest*	*Percentiles*	*Smallest*
1%	-3.54E-08	-3.54E-08	-4.19E-08	-0.001334	-4.10E-08	-5.15E-06
5%	-3.54E-08	0.0017087	2.63E-08	-0.0012671	1.68E-08	-4.28E-08
10%	0.0017087	0.0032165	0.0013984	-0.0007431	0.0016235	-4.28E-08
25%	0.0080589	0.0053334	0.0068127	-0.0003538	0.0072764	-4.10E-08
50%	**0.0194794**		**0.0179427**		**0.0171701**	
		Largest		*Largest*		*Largest*
75%	0.0290713	0.0315392	0.0371718	0.1197604	0.0355422	0.0896557
90%	0.0348868	0.0333681	0.056957	0.1236786	0.0559857	0.0906015
95%	0.0363742	0.0348868	0.0657918	0.1272225	0.0690206	0.0924163
99%	0.0363742	0.0363742	0.0923802	0.1303532	0.0896557	0.09464
Obs	18		900		378	
Mean	**0.0188664**		**0.0244901**		**0.0236522**	
Std. Dev.	0.011958		0.02252		0.0215731	

Table 11

Observable, state-level education characteristics during pre-treatment period							
Variable		Mean	Std. Dev.	Min	Max	Observations	
Student-teacher ratio	overall	15.79735	2.533368	10.47	24.4	N =	396
	between		2.359148	12.05444	22.78167	n =	22
	within		1.044943	10.12346	21.83179	T =	18
Per-pupil spending	overall	8354.559	2550.405	3537	18113	N =	396
	between		1189.347	5618.809	10488.48	n =	22
	within		2269.559	3906.083	15979.08	T =	18

Notes: Descriptive statistics include Iowa.

Table 12

All subgroups, birth rates, aged 15-19		
Predictor variable	Treated	Synthetic
Birth rates, ages 15-19	34.2063	34.17188
Percent population in poverty	9.381818	9.867709
Annual unemployment rate	3.563636	3.655327
Percent change in Hispanic population	0.0111284	0.0112836
Percent change in Black population	0.0039176	0.0040714
Inflation-adjusted per capita income	36815.56	37577.8
Gini measure of inequality	0.5409356	0.5596067
Control State	Weight	
Florida	0	
Indiana	0	
Kentucky	0	
Michigan	0	
Ohio	0	
Pennsylvania	0	
Utah	0.027	
Alaska	0	
Arizona	0	
Arkansas	0	
Colorado	0	
Idaho	0	
Louisiana	0	
Massachusetts	0.245	
Mississippi	0.264	
Montana	0	
Nebraska	0	
North Dakota	0	
Texas	0.003	
Virginia	0	
Wisconsin	0.461	

Notes: All predictor variables averaged over the years 1995-2005. Treatment year is 2006. Birth rates calculated per 1,000.

Table 13

White birth rates, ages 15-19		
Predictor variable	Treated	Synthetic
Birth rates, ages 15-19, White	29.35692	29.34865
Percent population in poverty	9.381818	9.876836
Annual unemployment rate	3.563636	4.235645
Percent change in Hispanic population	0.0111284	0.0116504
Percent change in Black population	0.0039176	0.0042332
Inflation-adjusted per capita income	36815.56	37707.85
Gini measure of inequality	0.5409356	0.5501678
Control State	Weight	
Florida	0	
Indiana	0	
Kentucky	0.097	
Michigan	0	
Ohio	0	
Pennsylvania	0	
Utah	0.197	
Alaska	0	
Arizona	0	
Arkansas	0	
Colorado	0	
Idaho	0	
Louisiana	0	
Massachusetts	0	
Mississippi	0	
Montana	0	
Nebraska	0	
North Dakota	0	
Texas	0	
Virginia	0	
Wisconsin	0.706	

Notes: All predictor variables averaged over the years 1995-2005. Treatment year is 2006. Birth rates calculated per 1,000.

Table 14

Black birth rates, ages 15-19		
Predictor variable	Treated	Synthetic
Birth rates, ages 15-19, Black	90.0055	89.69197
Percent population in poverty	9.381818	10.04869
Annual unemployment rate	3.563636	3.676827
Percent change in Hispanic population	0.0111284	0.018475
Percent change in Black population	0.0039176	0.0037276
Inflation-adjusted per capita income	36815.56	37175.53
Gini measure of inequality	0.5409356	0.5689684
Control State	Weight	
Florida	0	
Indiana	0	
Kentucky	0.068	
Michigan	0	
Ohio	0	
Pennsylvania	0	
Utah	0	
Alaska	0	
Arizona	0	
Arkansas	0	
Colorado	0	
Idaho	0	
Louisiana	0	
Massachusetts	0.531	
Mississippi	0	
Montana	0	
Nebraska	0	
North Dakota	0	
Texas	0.177	
Virginia	0	
Wisconsin	0.224	

Notes: All predictor variables averaged over the years 1995-2005. Treatment year is 2006. Birth rates calculated per 1,000.

Table 15

Hispanic birth rates, ages 15-19		
Predictor variable	Treated	Synthetic
Birth rates, ages 15-19, Hispanic	102.7322	102.6237
Percent population in poverty	9.381818	9.692155
Annual unemployment rate	3.563636	3.835982
Percent change in Hispanic population	0.0111284	0.0197235
Percent change in Black population	0.0039176	0.0031297
Inflation-adjusted per capita income	36815.56	40607.81
Percent population receiving food stamps	0.0538772	0.0515772
Control State	Weight	
Florida	0	
Indiana	0	
Kentucky	0	
Michigan	0.425	
Ohio	0	
Pennsylvania	0	
Utah	0	
Alaska	0	
Arizona	0	
Arkansas	0	
Colorado	0	
Idaho	0	
Louisiana	0	
Massachusetts	0.34	
Mississippi	0.028	
Montana	0	
Nebraska	0	
North Dakota	0	
Texas	0	
Virginia	0	
Wisconsin	0.207	

Notes: All predictor variables averaged over the years 1995-2005. Treatment year is 2006. Birth rates calculated per 1,000.

Table 16

Smaller donor pool: All subgroups, birth rates, ages 15-19		
Predictor variable	Treated	Synthetic
Birth rates, ages 15-19	34.2063	34.20654
Percent population in poverty	9.381818	10.59325
Annual unemployment rate	3.563636	5.005427
Percent change in Hispanic population	0.0111284	0.010166
Percent change in Black population	0.0039176	0.0055561
Inflation-adjusted per capita income	36815.56	39405.54
Gini measure of inequality	0.5409356	0.5732739
Control State	Weight	
Florida	0	
Indiana	0	
Kentucky	0	
Michigan	0	
Ohio	0	
Pennsylvania	0.897	
Utah	0.103	

Notes: All predictor variables averaged over the years 1995-2005. Treatment year is 2006. Birth rates calculated per 1,000. The smaller donor pool includes only 7 potential donor states.

Table 17

Smaller donor pool: White birth rates, ages 15-19		
Predictor variable	Treated	Synthetic
Birth rates, ages 15-19, White	29.35692	29.36619
Percent population in poverty	9.381818	10.35805
Annual unemployment rate	3.563636	4.737864
Percent change in Hispanic population	0.0111284	0.0111422
Percent change in Black population	0.0039176	0.0052896
Inflation-adjusted per capita income	36815.56	38443.73
Gini measure of inequality	0.5409356	0.5666529
Control State	Weight	
Florida	0	
Indiana	0.288	
Kentucky	0	
Michigan	0	
Ohio	0	
Pennsylvania	0.617	
Utah	0.095	

Notes: All predictor variables averaged over the years 1995-2005. Treatment year is 2006. Birth rates calculated per 1,000. The smaller donor pool includes only 7 potential donor states.

Table 18

Smaller donor pool: Black birth rates, ages 15-19		
Predictor variable	Treated	Synthetic
Birth rates, ages 15-19, Black	90.0055	89.23582
Percent population in poverty	9.381818	9.838891
Annual unemployment rate	3.563636	4.148436
Percent change in Hispanic population	0.0111284	0.0133535
Percent change in Black population	0.0039176	0.0046889
Inflation-adjusted per capita income	36815.56	36305.46
Gini measure of inequality	0.5409356	0.5521574
Control State	Weight	
Florida	0	
Indiana	0.918	
Kentucky	0	
Michigan	0	
Ohio	0	
Pennsylvania	0	
Utah	0.082	

Notes: All predictor variables averaged over the years 1995-2005. Treatment year is 2006. Birth rates calculated per 1,000. The smaller donor pool includes only 7 potential donor states.

Table 19

Smaller donor pool: Hispanic birth rates, ages 15-19		
Predictor variable	Treated	Synthetic
Birth rates, ages 15-19, Hispanic	102.7322	99.75388
Percent population in poverty	9.381818	9.8108
Annual unemployment rate	3.563636	4.3122
Percent change in Hispanic population	0.0111284	0.0228969
Percent change in Black population	0.0039176	0.0026135
Inflation-adjusted per capita income	36815.56	33650.04
Percent population receiving food stamps	0.0538772	0.0498319

Control State	Weight
Florida	0
Indiana	0
Kentucky	0
Michigan	0
Ohio	0
Pennsylvania	0.142
Utah	0.858

Notes: All predictor variables averaged over the years 1995-2005. Treatment year is 2006. Birth rates calculated per 1,000. The smaller donor pool includes only 7 potential donor states.

Table 20

Adolescent birth rates, aged 15-19 – fixed effects estimation				
	Aggregate	White	Black	Hispanic
Sex education policy change	1.951 (2.23)*	1.358 (2.80)*	0.725 (0.38)	-4.023 (0.97)
Percent population in poverty	0.646 (1.16)	0.106 (0.36)	-0.693 (0.67)	-1.943 (0.98)
Annual unemployment rate	-0.719 (2.59)*	-0.102 (0.58)	0.625 (1.07)	0.174 (0.10)
Change in percentage Hispanic population	-109.247 (2.55)*	-132.326 (4.99)**	-69.743 (1.31)	-205.863 (0.74)
Change in percentage Black population	29.264 (0.20)	8.761 (0.13)	-772.107 (2.67)*	-608.372 (1.37)
Inflation-adjusted per capita income	0.001 (2.91)**	0.000 (2.77)*	0.001 (1.03)	-0.001 (1.02)
Gini measure of inequality	12.137 (0.96)	23.572 (3.90)**	43.272 (2.59)*	227.686 (2.47)*
Percent population receiving food stamps	-15.516 (0.38)	-15.096 (0.75)	45.123 (0.54)	-37.148 (0.20)
$\mathbf{R^2}$	0.81	0.93	0.77	0.50
N	396	396	396	396

* $p<0.05$; ** $p<0.01$

Notes: Birth rates calculated per 1,000. Estimation based on full control group of 21 donor states. Standard errors are clustered at the state level. Estimation includes both year and state fixed effects.

Table 21

Adolescent birth rates – fixed effects estimation *Reduced control group of only 7 donor states				
	Aggregate	White	Black	Hispanic
Sex education policy change	-0.323	1.266	-0.928	-17.144
	(0.20)	(1.13)	(0.61)	(2.22)
Percent population in poverty	1.040	-0.088	0.617	-2.962
	(2.60)*	(0.39)	(0.80)	(1.01)
Annual unemployment rate	0.359	0.714	0.027	-1.974
	(0.39)	(2.22)	(0.03)	(1.04)
Change in percentage Hispanic population	-118.962	-133.568	51.817	-293.960
	(3.46)*	(3.65)**	(0.99)	(1.15)
Change in percentage Black population	-412.314	-114.684	-1,247.639	-183.902
	(4.43)**	(0.88)	(6.00)**	(0.23)
Inflation-adjusted per capita income	0.002	0.001	0.001	0.001
	(2.66)*	(1.92)	(2.03)	(0.54)
Gini measure of inequality	33.481	19.035	27.600	307.161
	(0.73)	(0.89)	(0.80)	(1.29)
Percent population receiving food stamps	-31.084	-5.488	33.799	474.406
	(0.73)	(0.18)	(0.61)	(3.07)*
R^2	0.94	0.96	0.95	0.79
N	144	144	144	144

* $p<0.05$; ** $p<0.01$

Notes: Birth rates calculated per 1,000. Estimation based on reduced control group of 7 donor states. Standard errors are clustered at the state level. Estimation includes both year and state fixed effects.

Table 22

White, female graduation rates		
Predictor variable	Treated	Synthetic
Graduation rates, White female	0.9252679	0.9253053
White birth rates, ages 15-19	29.35692	29.65561
Student-teacher ratio	17.01818	16.37165
Per pupil spending	7385.505	7001.486
Percent change in Hispanic population	0.0111284	0.0121887
Percent change in Black population	0.0039176	0.0035692
Inflation-adjusted per capita income	36815.56	35726.6
Percent population in poverty	9.381818	10.47634
Annual unemployment rate	3.563636	3.635245
Gini measure of inequality	0.5409356	0.5649632

Control State	Weight
Florida	0
Indiana	0
Kentucky	0
Michigan	0
Ohio	0
Pennsylvania	0
Utah	0.265
Alaska	0
Arizona	0
Arkansas	0
Colorado	0.032
Idaho	0
Louisiana	0
Massachusetts	0.2
Mississippi	0.375
Montana	0.001
Nebraska	0
North Dakota	0
Texas	0.127
Virginia	0
Wisconsin	0

Notes: All predictor variables averaged over the years 1995-2005. Treatment year is 2006. Birth rates calculated per 1,000.

Table 23

Black, female graduation rates		
Predictor variable	Treated	Synthetic
Graduation rates, Black, female	0.839032	0.8367766
Black birth rates, ages 15-19	89.34132	92.71838
Student-teacher ratio	17.01818	15.51101
Per pupil spending	7385.505	7753.542
Percent change in Hispanic population	0.0111284	0.0102121
Percent change in Black population	0.0039176	0.0044134
Inflation-adjusted per capita income	36815.56	38285.91
Percent population in poverty	9.381818	9.661891
Gini measure of inequality	0.5409356	0.5494287
Control State	Weight	
Florida	0	
Indiana	0	
Kentucky	0	
Michigan	0	
Ohio	0	
Pennsylvania	0	
Utah	0.251	
Alaska	0	
Arizona	0	
Arkansas	0	
Colorado	0.144	
Idaho	0	
Louisiana	0	
Massachusetts	0	
Mississippi	0	
Montana	0.06	
Nebraska	0	
North Dakota	0	
Texas	0	
Virginia	0	
Wisconsin	0.545	

Notes: All predictor variables averaged over the years 1995-2005. Treatment year is 2006. Birth rates calculated per 1,000.

Table 24

Hispanic, female graduation rates		
Predictor variable	Treated	Synthetic
Graduation rates, Hispanic, female	0.7928087	0.7928171
Hispanic birth rates, ages 15-19	102.7322	99.67887
Student-teacher ratio	17.01818	17.01477
Per pupil spending	7385.505	7069.686
Percent change in Hispanic population	0.0111284	0.0175651
Percent change in Black population	0.0039176	0.0039167
Inflation-adjusted per capita income	36815.56	36830.68
Percent population in poverty	9.381818	9.8709
Gini measure of inequality	0.5409356	0.5678052
Control State	Weight	
Florida	0	
Indiana	0	
Kentucky	0	
Michigan	0.007	
Ohio	0	
Pennsylvania	0	
Utah	0.209	
Alaska	0	
Arizona	0	
Arkansas	0	
Colorado	0	
Idaho	0	
Louisiana	0	
Massachusetts	0.46	
Mississippi	0.076	
Montana	0	
Nebraska	0	
North Dakota	0	
Texas	0.192	
Virginia	0	
Wisconsin	0.056	

Notes: All predictor variables averaged over the years 1995-2005. Treatment year is 2006. Birth rates calculated per 1,000.

Table 25

Smaller donor pool: White, female graduation rates		
Predictor variable	Treated	Synthetic
Graduation rates, White female	0.9252679	0.9253209
White birth rates, ages 15-19	29.35692	34.24294
Student-teacher ratio	17.01818	17.13819
Per pupil spending	7385.505	7098.405
Percent change in Hispanic population	0.0111284	0.0110895
Percent change in Black population	0.0039176	0.0046884
Inflation-adjusted per capita income	36815.56	36824.98
Percent population in poverty	9.381818	11.36982
Annual unemployment rate	3.563636	4.815682
Gini measure of inequality	0.5409356	0.5649591

Control State	Weight
Florida	0
Indiana	0.21
Kentucky	0.195
Michigan	0
Ohio	0.051
Pennsylvania	0.406
Utah	0.138

Notes: All predictor variables averaged over the years 1995-2005. Treatment year is 2006. Birth rates calculated per 1,000. The smaller donor pool includes only 7 potential donor states.

Table 26

Smaller donor pool: Black, female graduation rates		
Predictor variable	Treated	Synthetic
Graduation rates, Black, female	0.839032	0.8387454
Black birth rates, ages 15-19	90.0055	88.93051
Student-teacher ratio	17.01818	16.6309
Per pupil spending	7385.505	7411.171
Percent change in Hispanic population	0.0111284	0.0112485
Percent change in Black population	0.0039176	0.0049117
Inflation-adjusted per capita income	36815.56	37089.85
Percent population in poverty	9.381818	10.20197
Gini measure of inequality	0.5409356	0.5539732
Control State	Weight	
Florida	0	
Indiana	0.725	
Kentucky	0.018	
Michigan	0.041	
Ohio	0.069	
Pennsylvania	0.124	
Utah	0.023	

Notes: All predictor variables averaged over the years 1995-2005. Treatment year is 2006. Birth rates calculated per 1,000. The smaller donor pool includes only 7 potential donor states.

Table 27

Smaller donor pool: Hispanic, female graduation rates		
Predictor variable	Treated	Synthetic
Graduation rates, Hispanic, female	0.7928087	0.7887322
Hispanic birth rates, ages 15-19	102.7322	90.54718
Student-teacher ratio	17.01818	18.37905
Per pupil spending	7385.505	6809.936
Percent change in Hispanic population	0.0111284	0.0148674
Percent change in Black population	0.0039176	0.0040165
Inflation-adjusted per capita income	36815.56	36219.19
Percent population in poverty	9.381818	10.05977
Gini measure of inequality	0.5409356	0.560464
Control State	Weight	
Florida	0	
Indiana	0.485	
Kentucky	0	
Michigan	0.094	
Ohio	0	
Pennsylvania	0.142	
Utah	0.279	

Notes: All predictor variables averaged over the years 1995-2005. Treatment year is 2006. Birth rates calculated per 1,000. The smaller donor pool includes only 7 potential donor states.

Table 28

Female graduation rates – fixed effects estimation			
	White	Black	Hispanic
Sex education policy change	-0.021	-0.069	-0.009
	(2.73)*	(4.26)**	(0.49)
Student-teacher ratio	-0.003	0.002	0.002
	(0.76)	(0.50)	(0.37)
Per-pupil spending	0.000	0.000	0.000
	(2.22)*	(2.09)*	(2.06)
Change in percentage Hispanic population	-0.064	-0.512	-1.379
	(0.18)	(0.58)	(1.59)
Change in percentage Black population	2.512	0.941	2.351
	(2.09)*	(0.40)	(0.90)
Inflation-adjusted per capita income	-0.000	-0.000	-0.000
	(2.01)	(1.93)	(0.50)
Percent population in poverty	-0.001	-0.020	-0.009
	(0.15)	(2.02)	(1.05)
Annual unemployment rate	-0.004	0.008	-0.000
	(1.15)	(1.00)	(0.06)
Gini measure of inequality	0.014	-0.073	0.103
	(0.09)	(0.25)	(0.34)
R^2	0.41	0.35	0.23
N	396	396	396

* $p<0.05$; ** $p<0.01$

Notes: Estimation based on full control group of 21 donor states. Standard errors are clustered at the state level. Estimation includes both year and state fixed effects.

Table 29

Smaller donor pool: Female graduation rates – fixed effects estimation			
	White	Black	Hispanic
Sex education policy change	-0.001	-0.014	-0.059
	(0.05)	(0.53)	(1.11)
Student-teacher ratio	0.007	0.012	0.005
	(0.84)	(0.68)	(0.98)
Per-pupil spending	0.000	0.000	-0.000
	(2.03)	(1.33)	(0.17)
Change in percentage Hispanic population	-0.301	-0.735	-3.624
	(0.67)	(0.42)	(1.93)
Change in percentage Black population	1.892	4.291	5.055
	(0.82)	(0.87)	(0.51)
Inflation-adjusted per capita income	-0.000	-0.000	0.000
	(0.99)	(2.45)*	(1.40)
Percent population in poverty	-0.001	-0.003	-0.002
	(0.06)	(0.16)	(0.13)
Annual unemployment rate	-0.010	-0.018	0.009
	(0.93)	(0.97)	(0.59)
Gini measure of inequality	0.891	1.056	0.732
	(2.19)	(1.33)	(0.46)
R2	0.44	0.43	0.22
N	144	144	144

* $p<0.05$; ** $p<0.01$

Notes: Estimation based on smaller control group of 7 donor states. Standard errors are clustered at the state level. Estimation includes both year and state fixed effects.

FIGURES

Figure 1

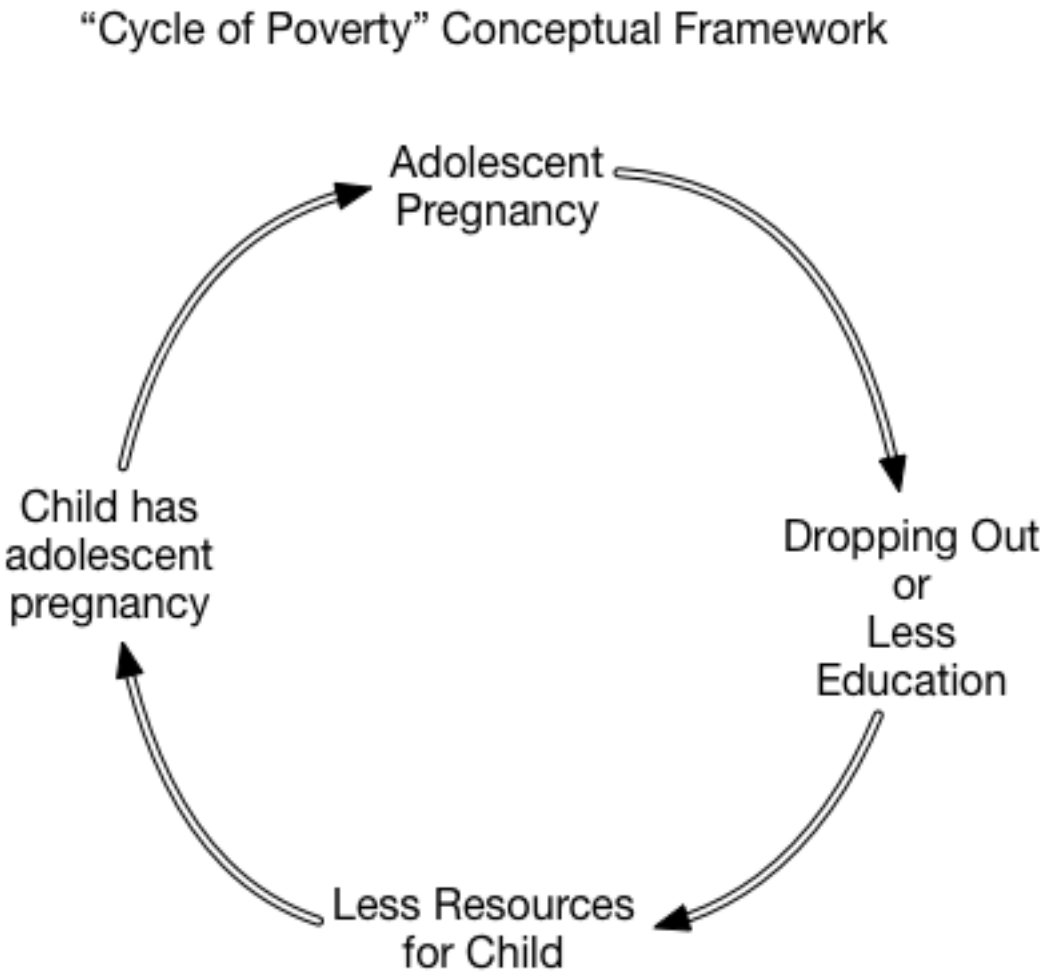


Figure 2

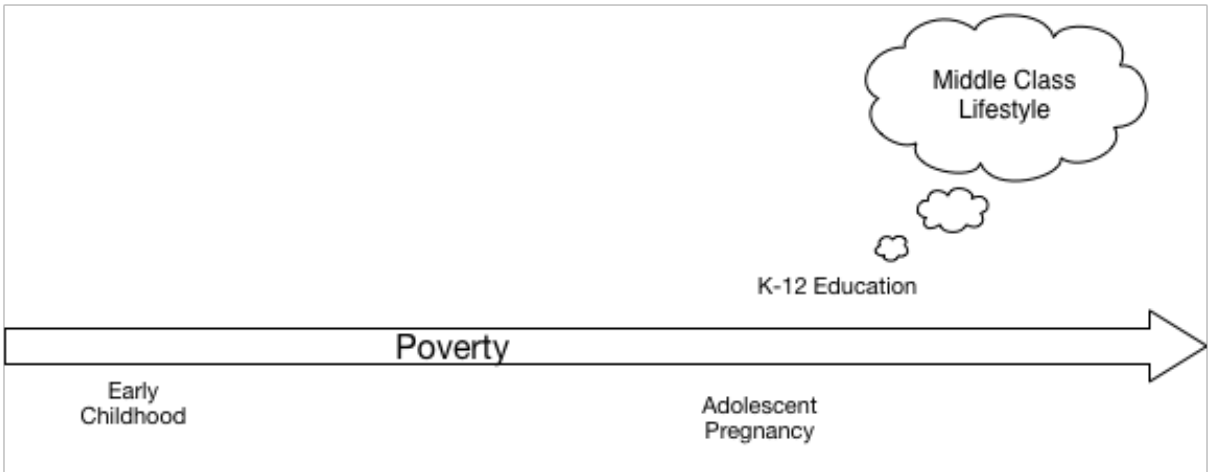
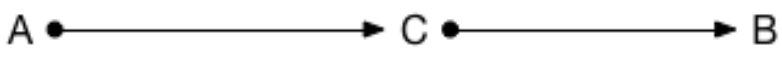
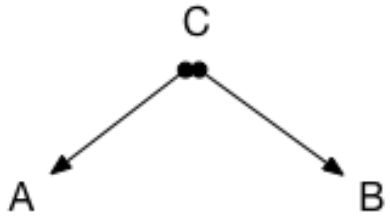

Middle Class
Lifestyle
K-12 Education
Poverty
Early
Childhood
Adolescent
Pregnancy

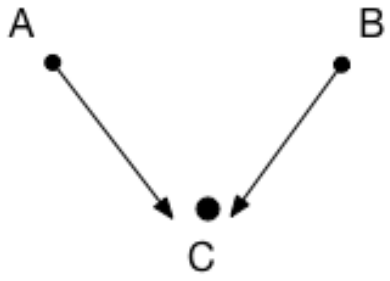
Figure 3



(a) Mediation



(b) Mutual dependence;
this presents confounding bias
as A and B share a parent node C



(b) Mutual causation;
in this case C is an endogenous regressor

Figure 4

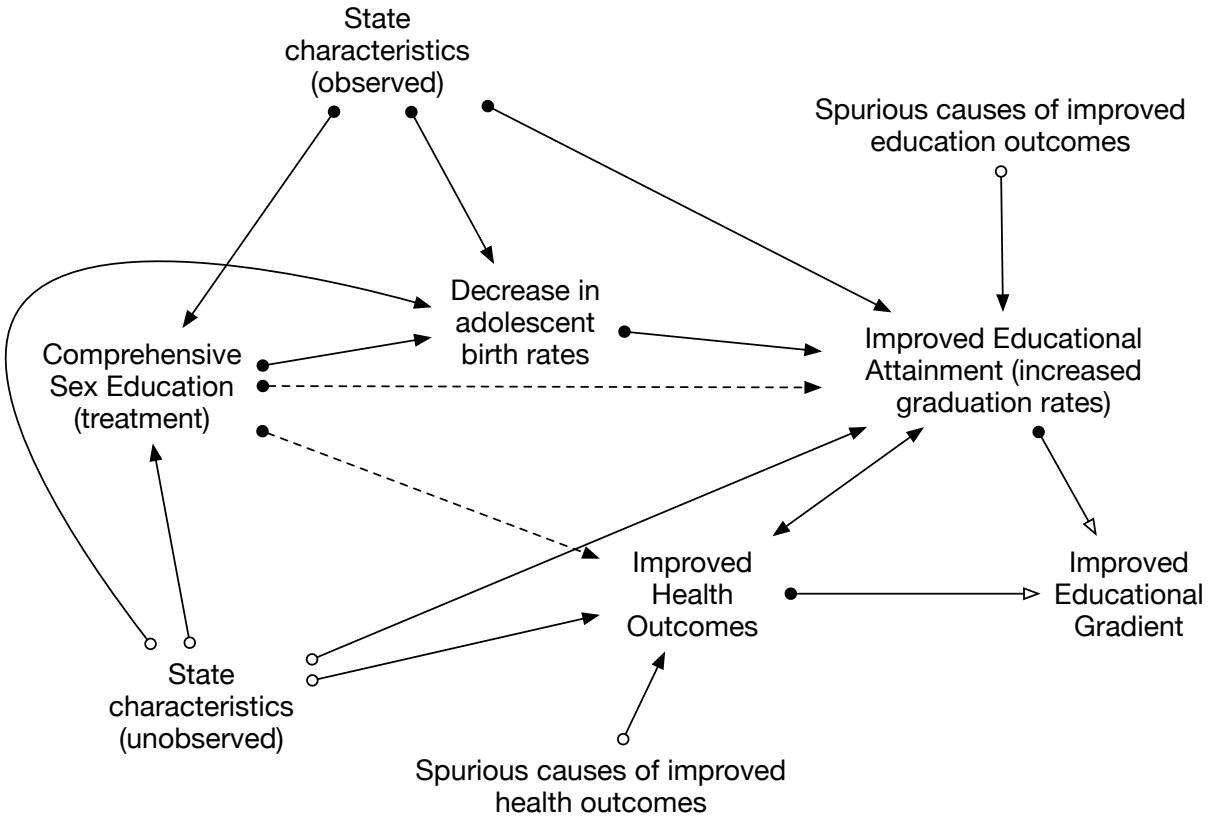

State characteristics (observed)
Spurious causes of improved education outcomes
Decrease in adolescent birth rates
Comprehensive Sex Education (treatment)
Improved Educational Attainment (increased graduation rates)
Improved Health Outcomes
Improved Educational Gradient
State characteristics (unobserved)
Spurious causes of improved health outcomes

Figure 5

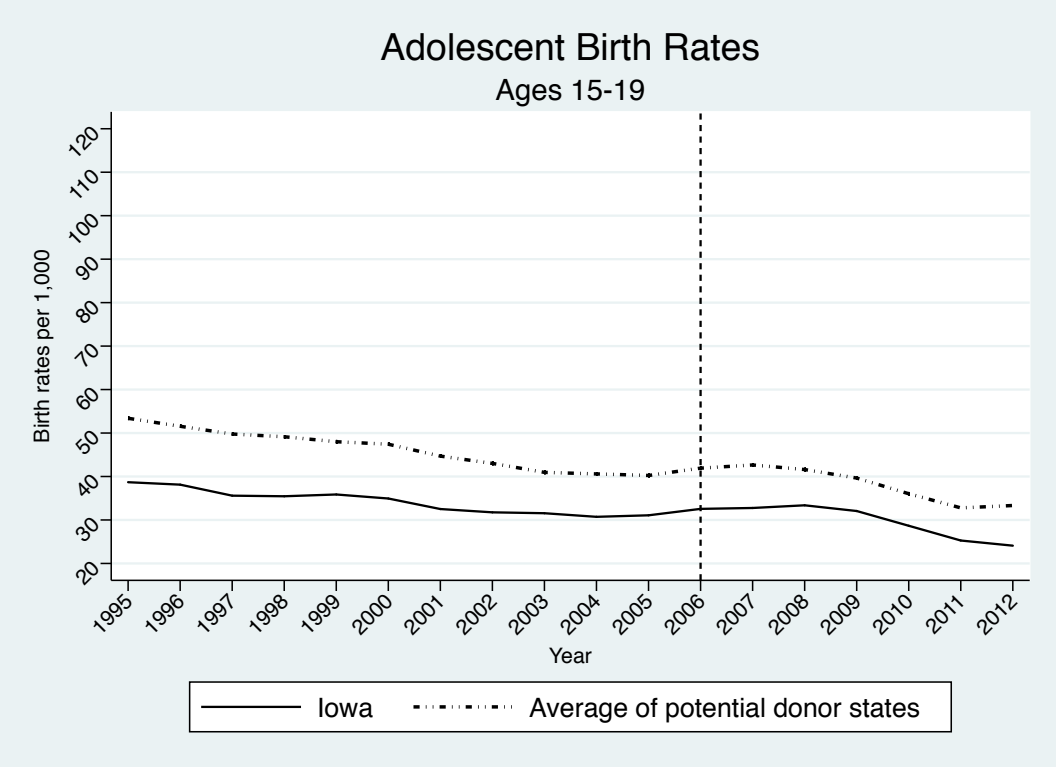

Adolescent Birth Rates
Ages 15-19
Birth rates per 1,000
120
110
100
90
80
70
60
50
40
30
20
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Year
Iowa
Average of potential donor states

Figure 6

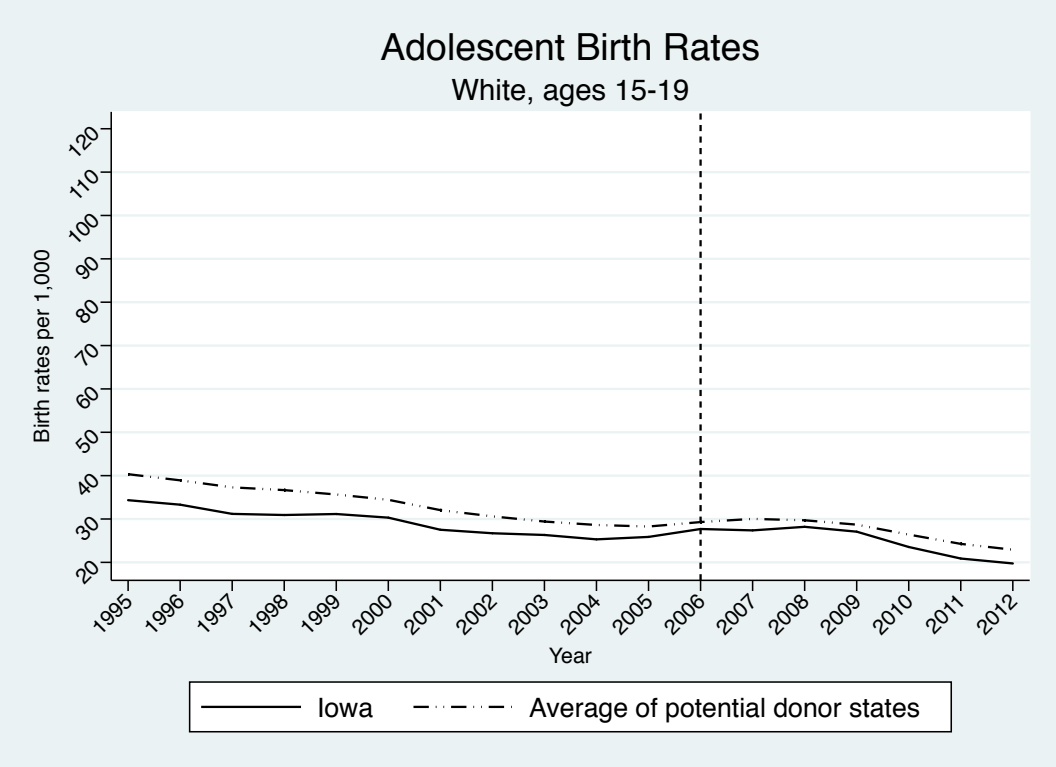

Adolescent Birth Rates
White, ages 15-19
Birth rates per 1,000
20
30
40
50
60
70
80
90
100
110
120
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Year
Iowa
Average of potential donor states

Figure 7

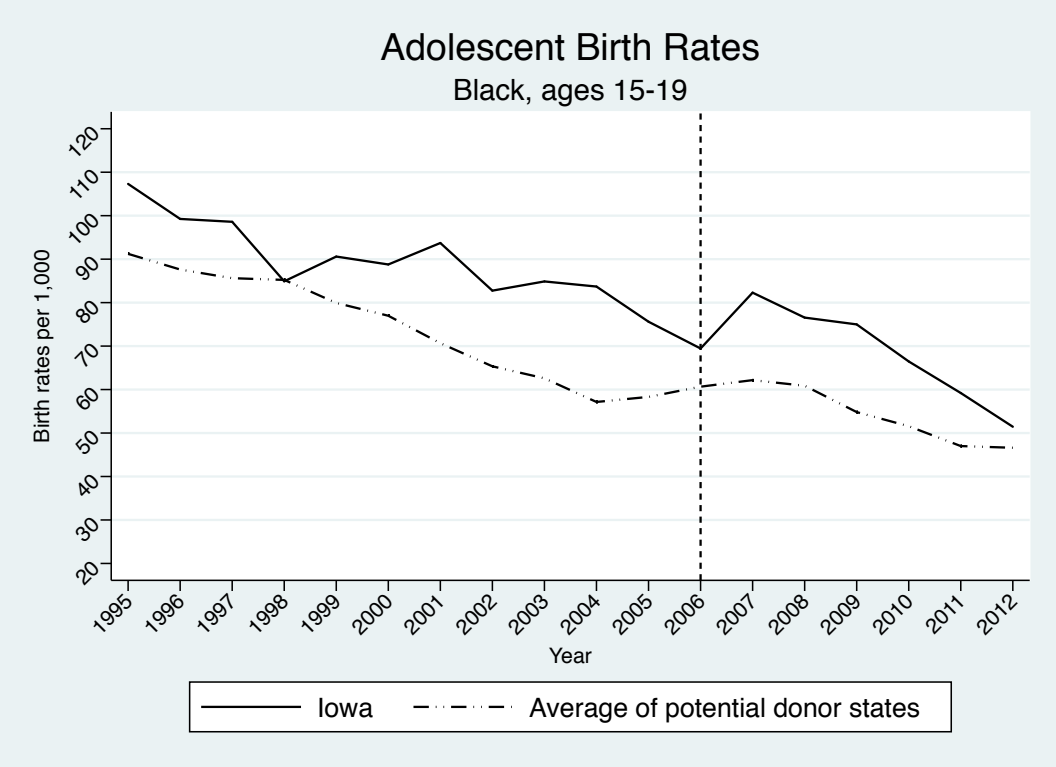

Adolescent Birth Rates
Black, ages 15-19
Birth rates per 1,000
120
110
100
90
80
70
60
50
40
30
20
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Year
Iowa
Average of potential donor states

Figure 8

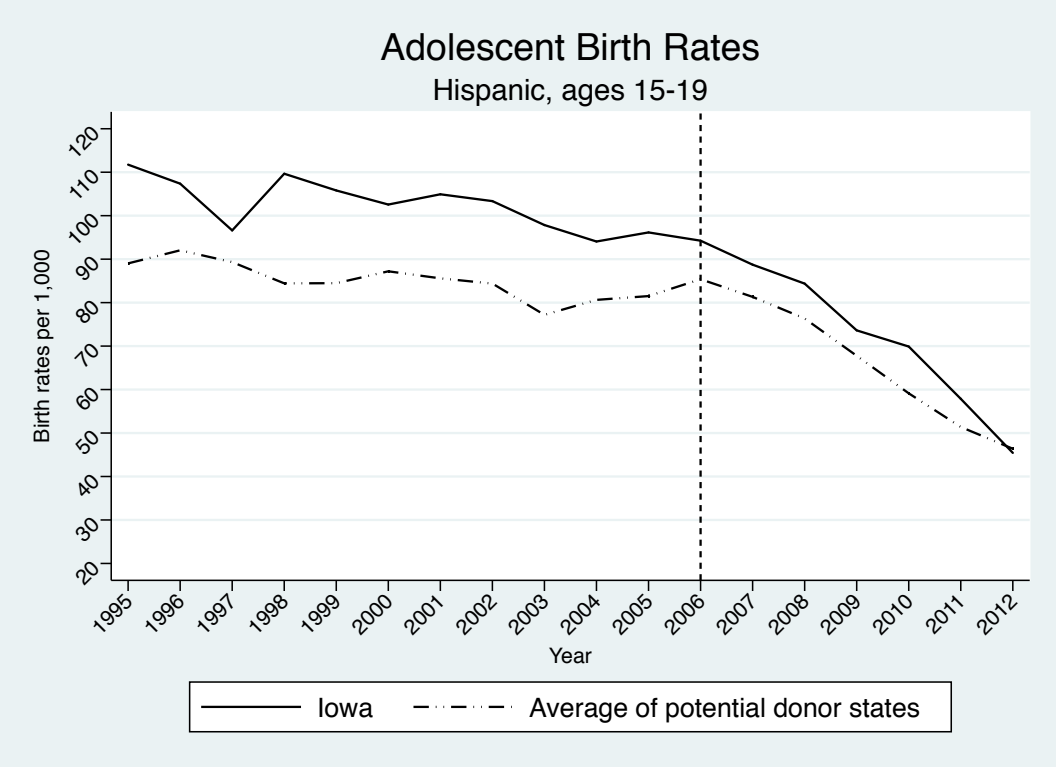

Adolescent Birth Rates
Hispanic, ages 15-19
Birth rates per 1,000
120
110
100
90
80
70
60
50
40
30
20
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Year
Iowa
Average of potential donor states

Figure 9

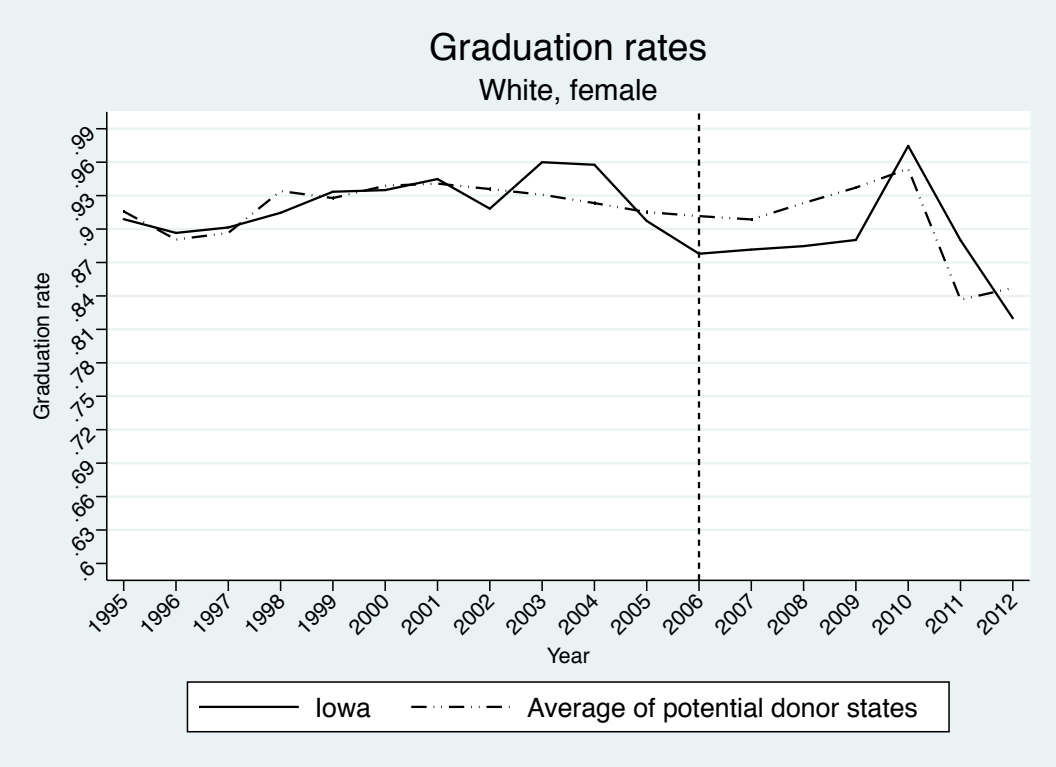

Graduation rates
White, female
Graduation rate
.6
.63
.66
.69
.72
.75
.78
.81
.84
.87
.9
.93
.96
.99
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Year
Iowa
Average of potential donor states

Figure 10

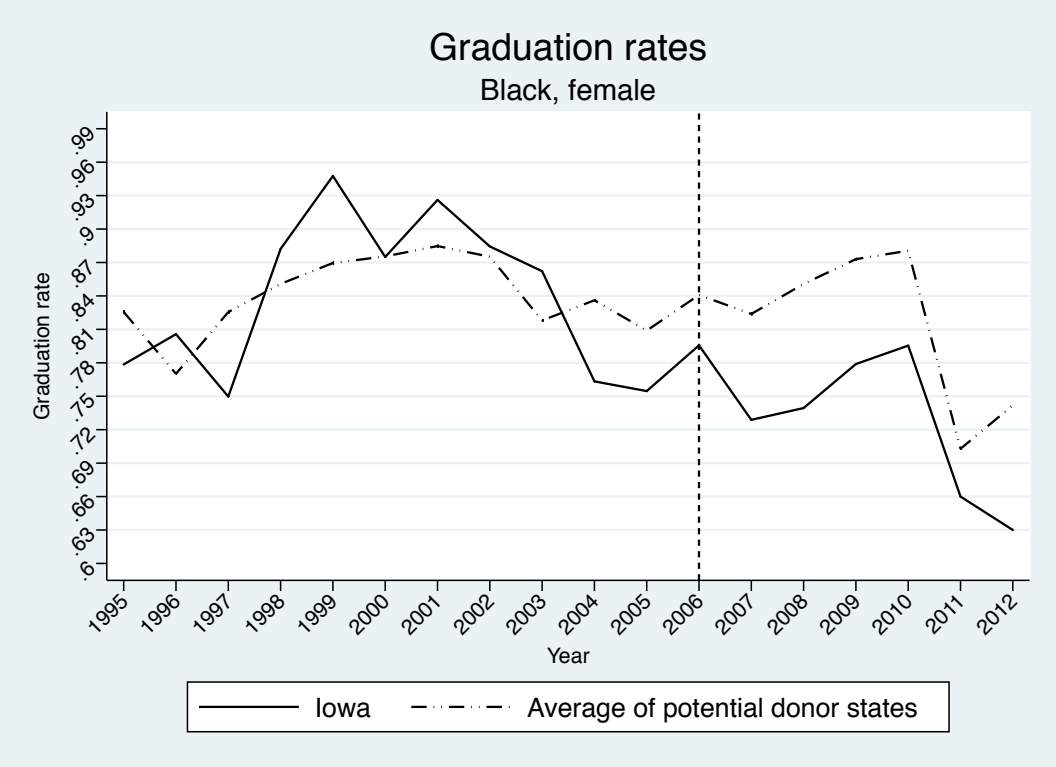

Graduation rates
Black, female
Graduation rate
.6
.63
.66
.69
.72
.75
.78
.81
.84
.87
.9
.93
.96
.99
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Year
Iowa
Average of potential donor states

Figure 11

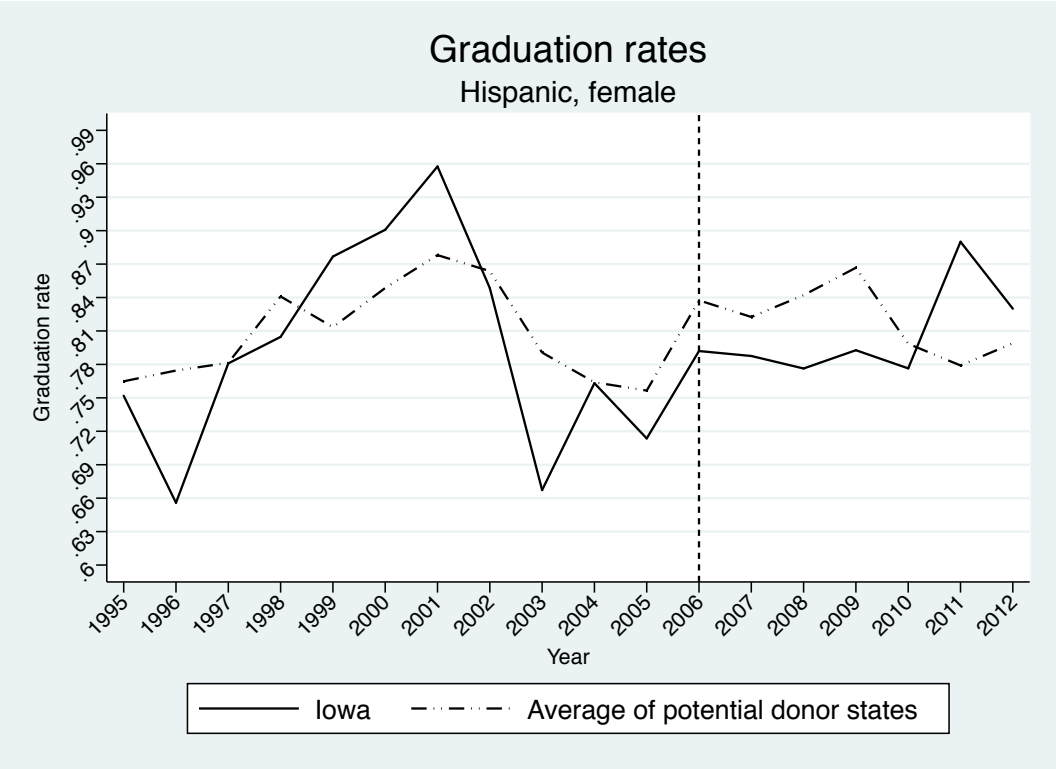

Graduation rates
Hispanic, female
Graduation rate
.6
.63
.66
.69
.72
.75
.78
.81
.84
.87
.9
.93
.96
.99
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Year
Iowa
Average of potential donor states

Figure 12

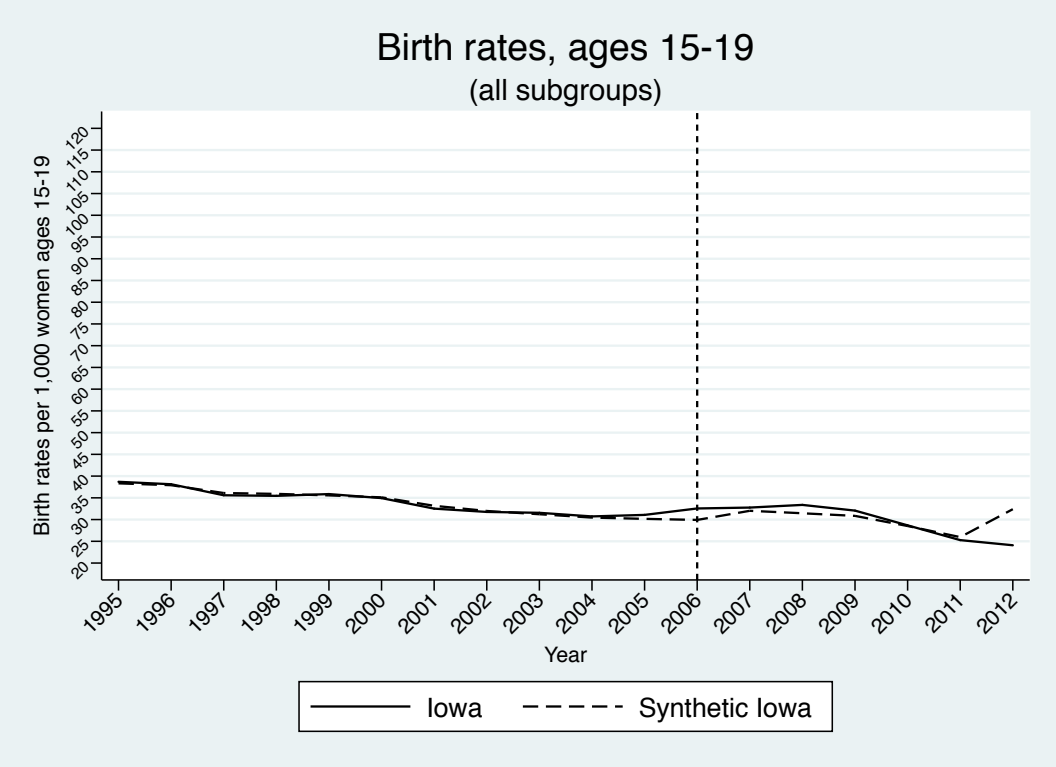

Birth rates, ages 15-19
(all subgroups)
Birth rates per 1,000 women ages 15-19
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Year
Iowa
Synthetic Iowa

Figure 13

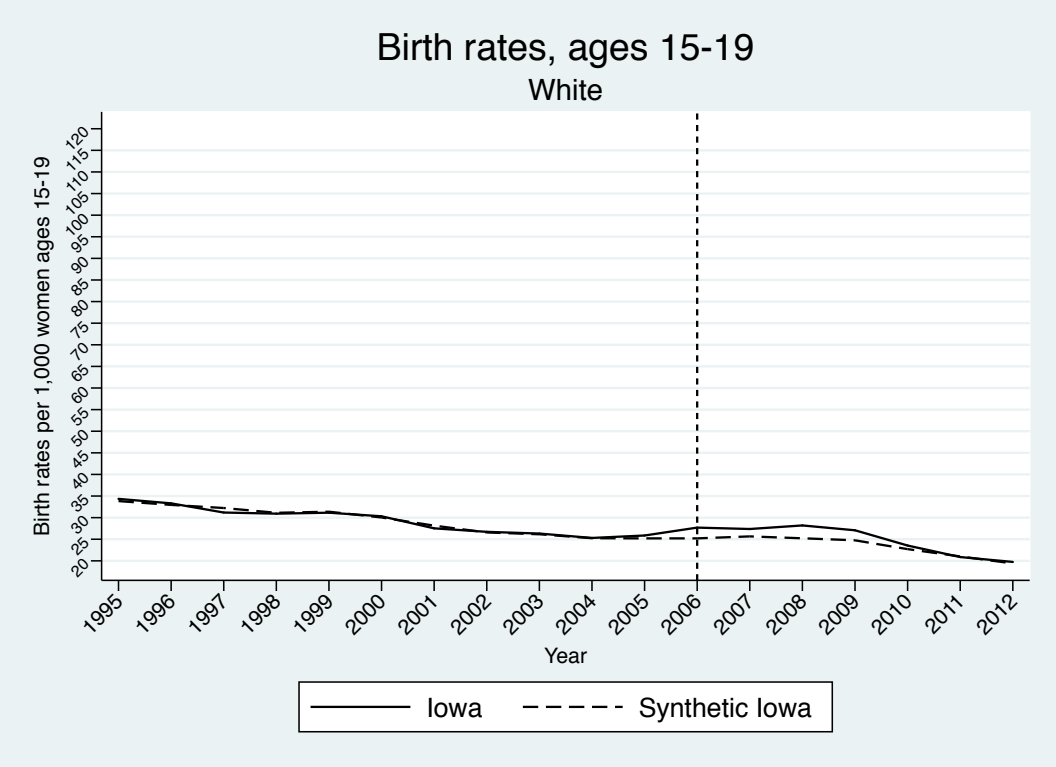

Birth rates, ages 15-19
White
Birth rates per 1,000 women ages 15-19
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Year
Iowa
Synthetic Iowa

Figure 14

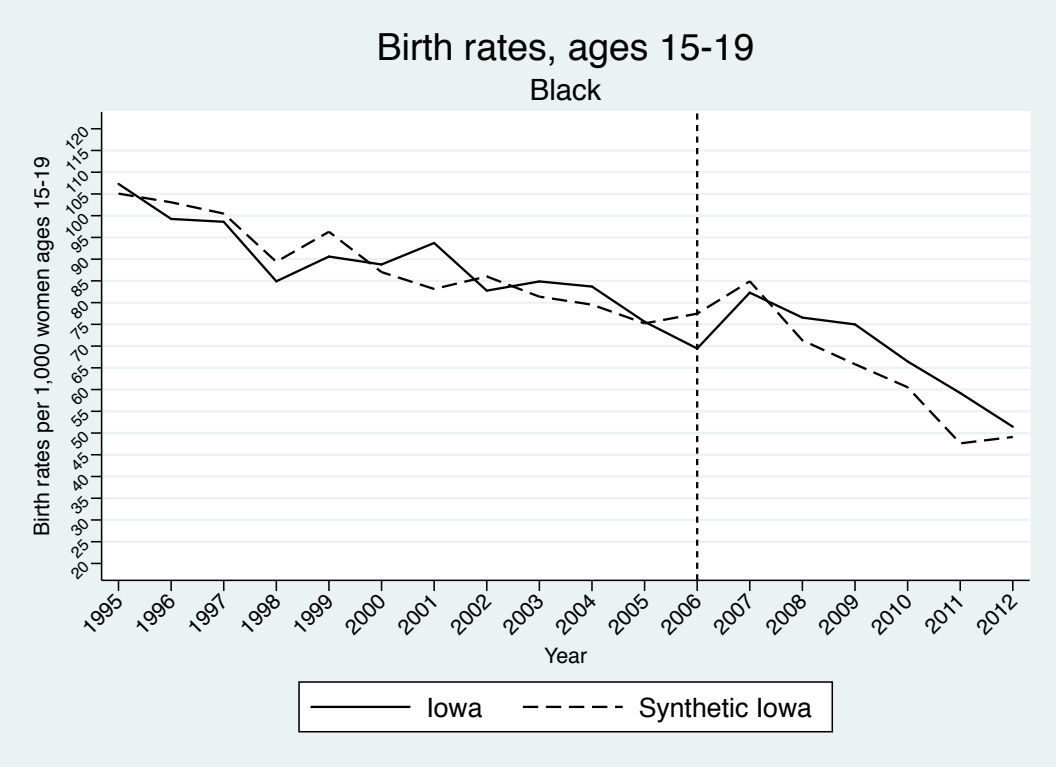

Birth rates, ages 15-19
Black
Birth rates per 1,000 women ages 15-19
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Year
Iowa
Synthetic Iowa

Figure 15

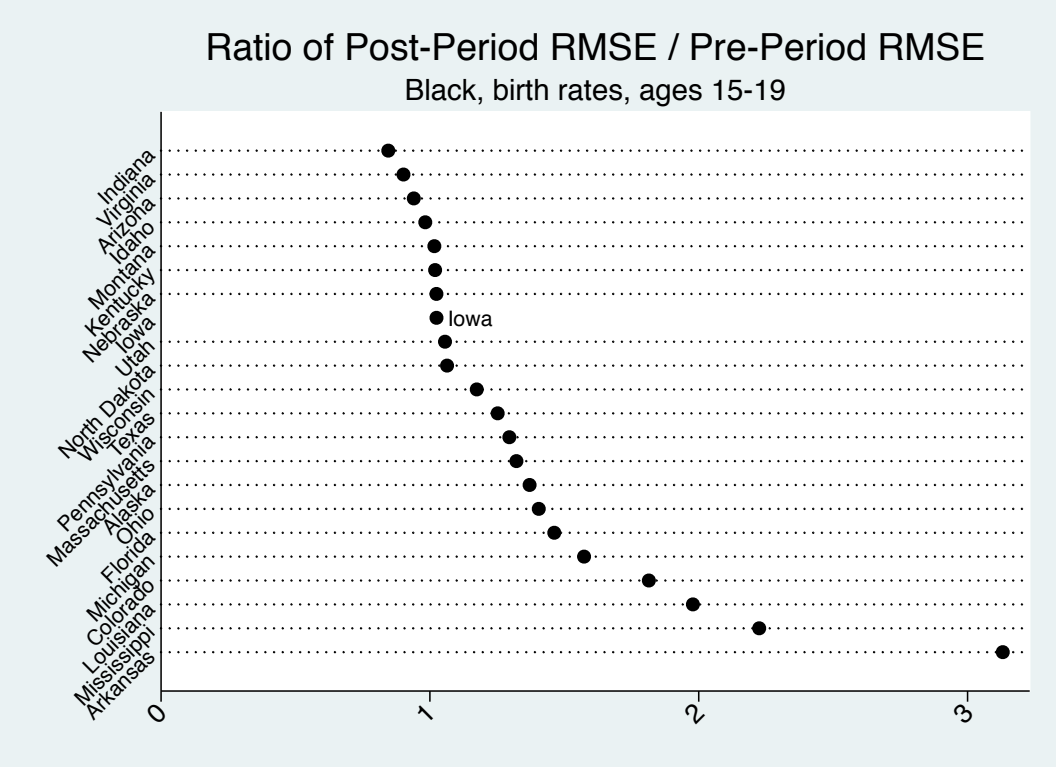

Ratio of Post-Period RMSE / Pre-Period RMSE
Black, birth rates, ages 15-19
Indiana
Virginia
Arizona
Idaho
Montana
Kentucky
Nebraska
Iowa
Utah
North Dakota
Wisconsin
Texas
Pennsylvania
Massachusetts
Alaska
Ohio
Florida
Michigan
Colorado
Louisiana
Mississippi
Arkansas
0
1
2
3

Figure 16

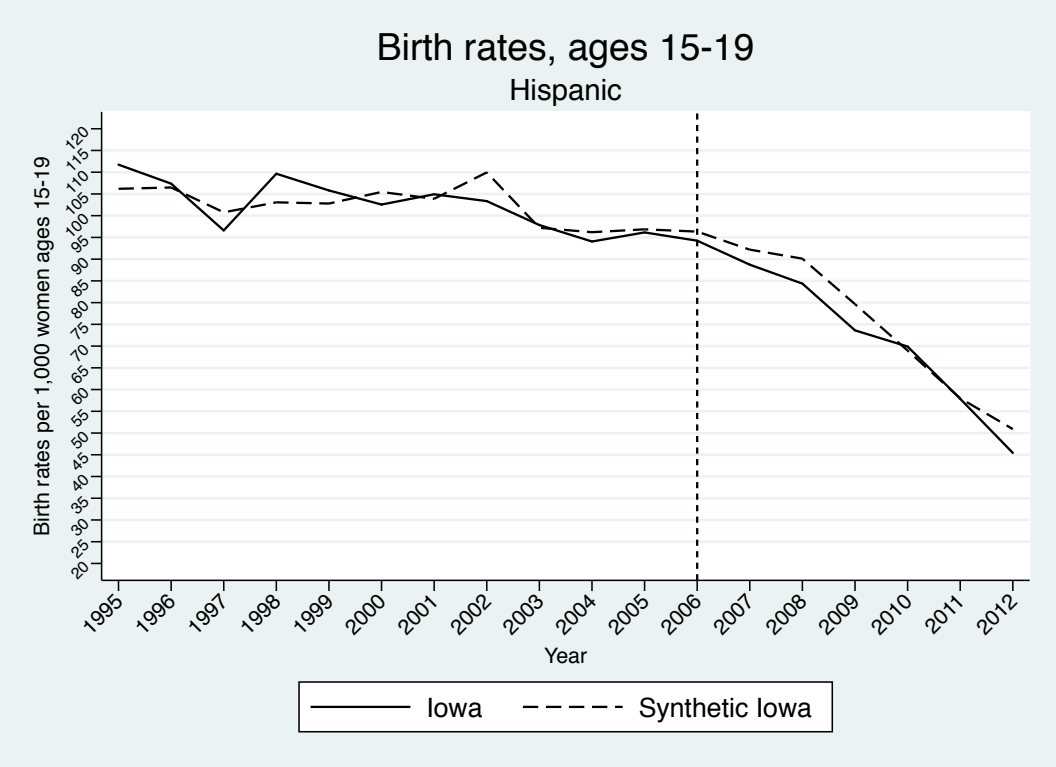

Birth rates, ages 15-19
Hispanic
Birth rates per 1,000 women ages 15-19
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Year
Iowa
Synthetic Iowa

Figure 17

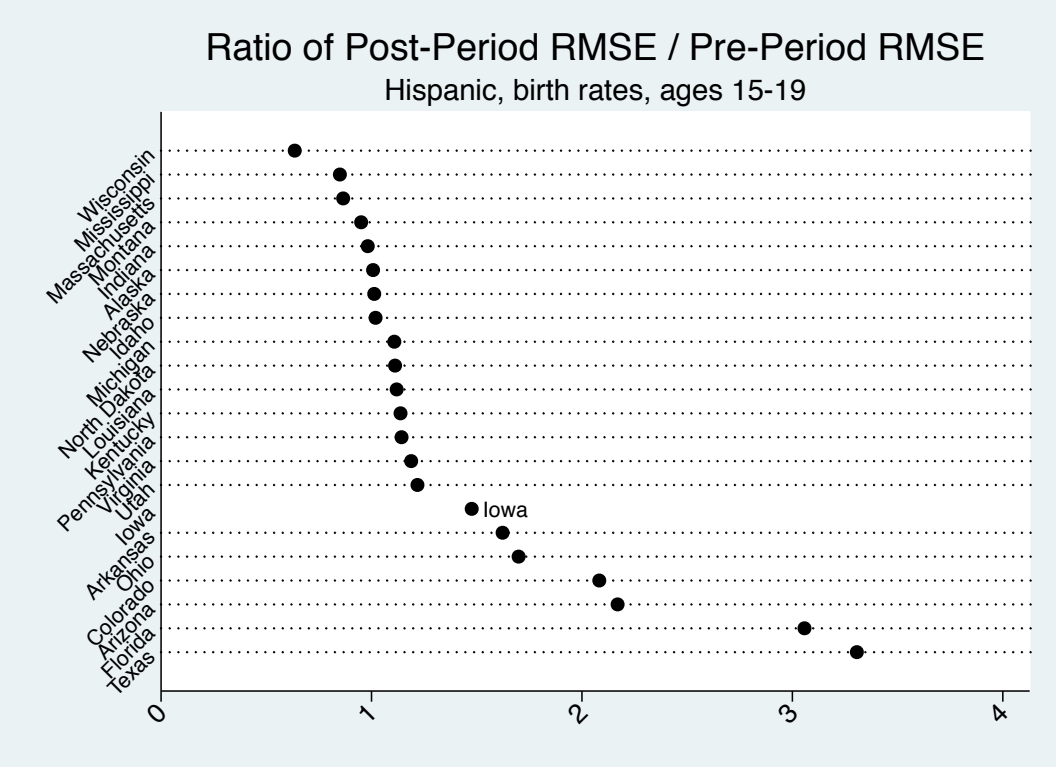
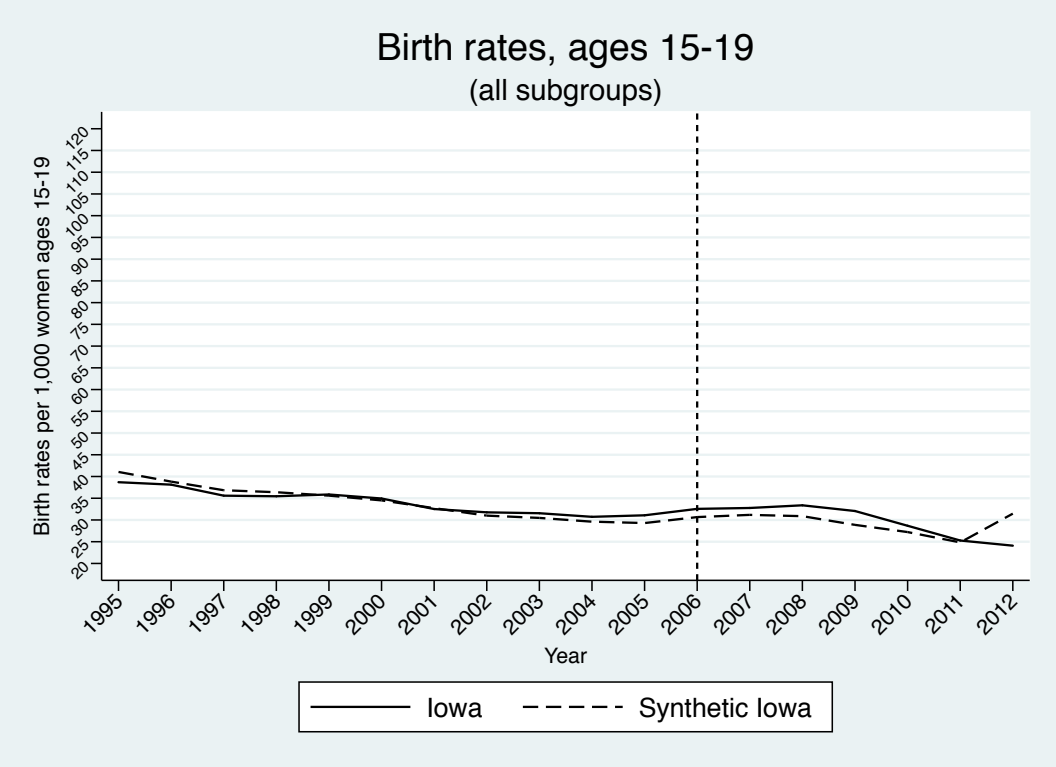
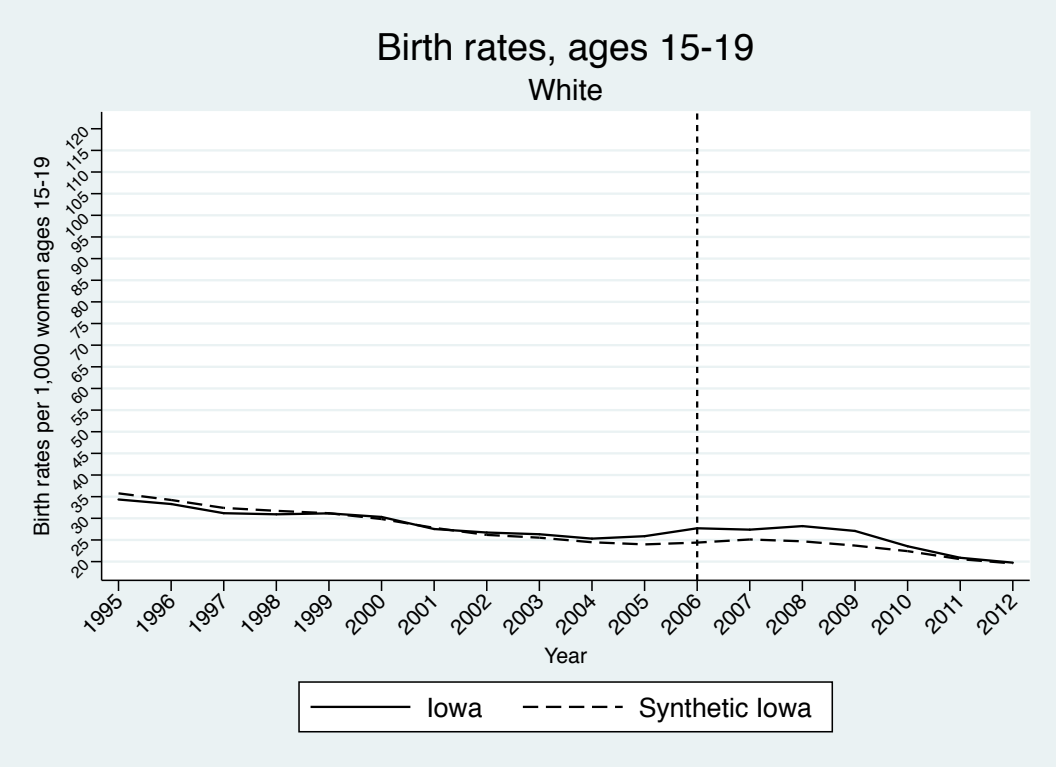

Ratio of Post-Period RMSE / Pre-Period RMSE
Hispanic, birth rates, ages 15-19
Wisconsin
Mississippi
Massachusetts
Montana
Indiana
Alaska
Nebraska
Idaho
Michigan
North Dakota
Louisiana
Kentucky
Pennsylvania
Virginia
Utah
Iowa
Iowa
Arkansas
Ohio
Colorado
Arizona
Florida
Texas
0
1
2
3
4

Figure 18



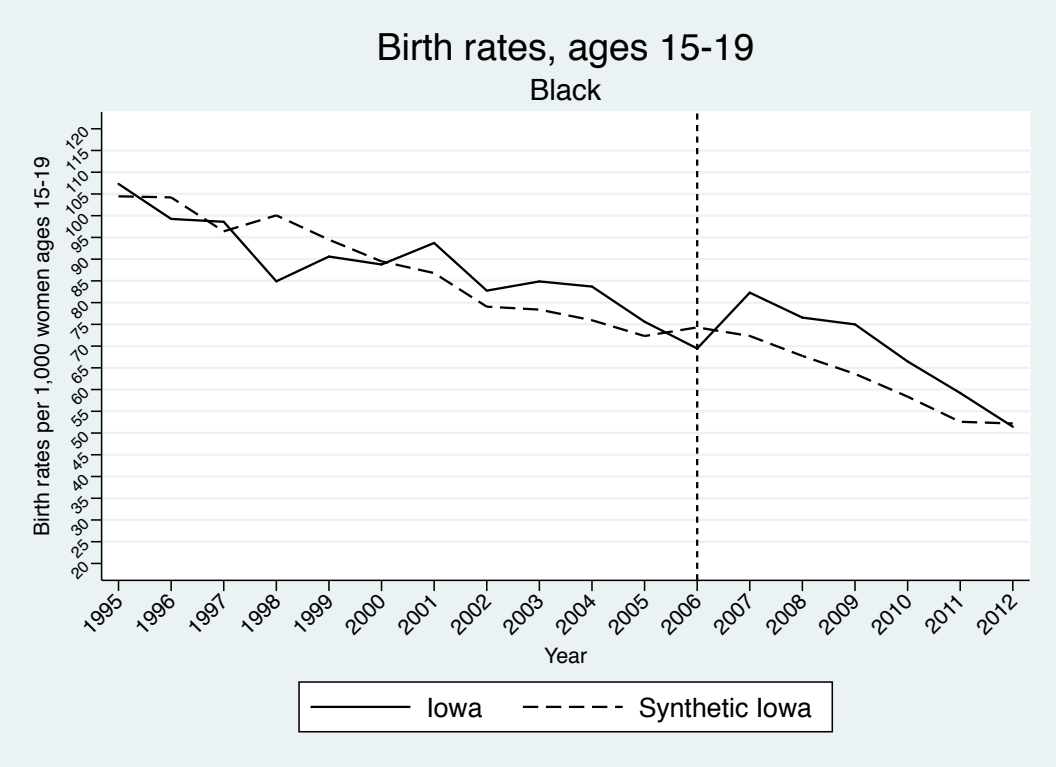
Notes: This graph depicts the synthetic control when using only states with abstinence-only sex education (i.e. the smaller donor pool).

Figure 19



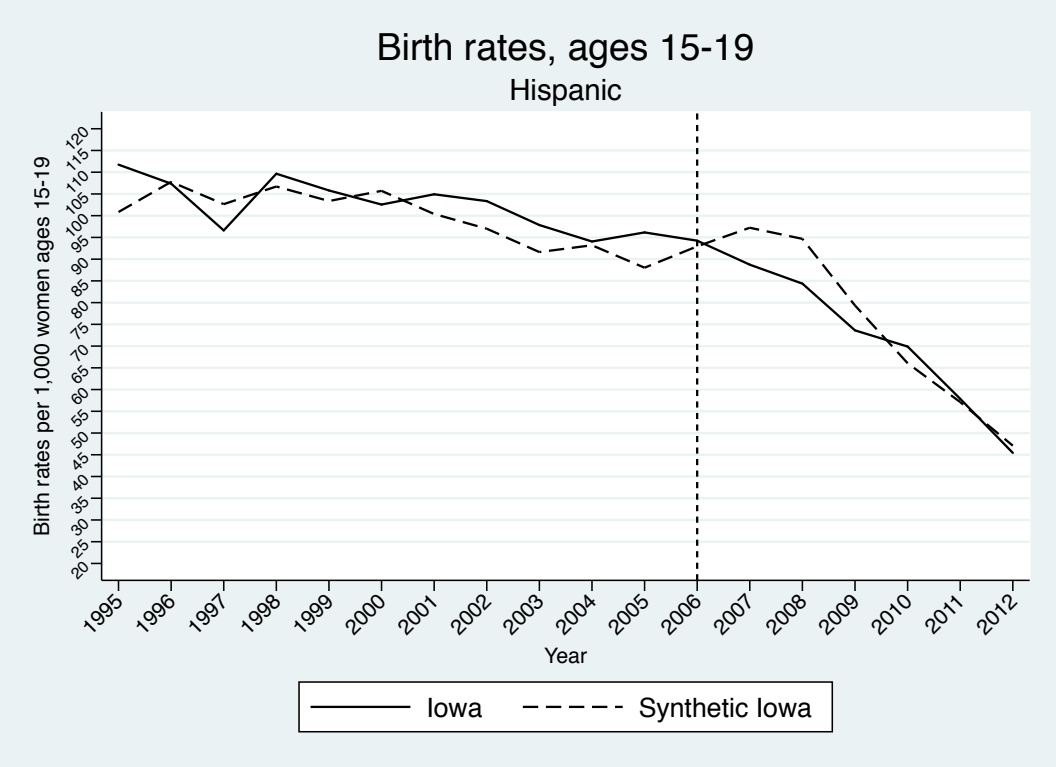
Notes: This graph depicts the synthetic control when using only states with abstinence-only sex education (i.e. the smaller donor pool).

Figure 20



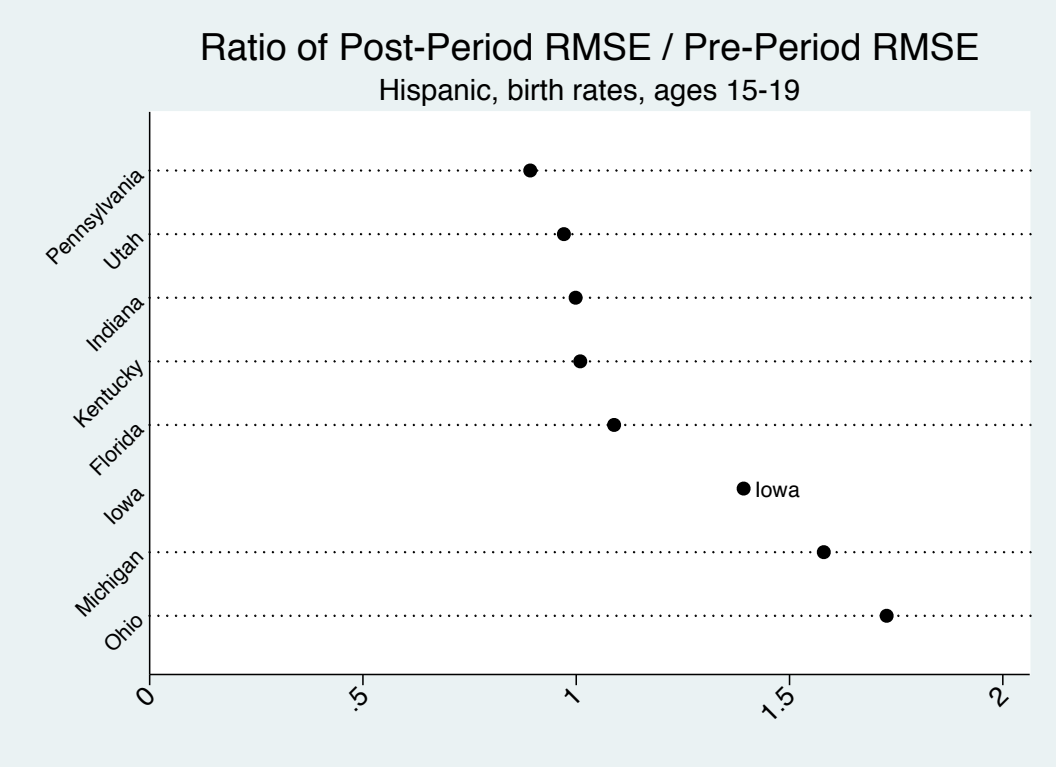
Notes: This graph depicts the synthetic control when using only states with abstinence-only sex education (i.e. the smaller donor pool).

Figure 21



Notes: This graph depicts the synthetic control when using only states with abstinence-only sex education (i.e. the smaller donor pool).

Figure 22



Notes: This graph depicts the synthetic control when using only states with abstinence-only sex education (i.e. the smaller donor pool).

Figure 23

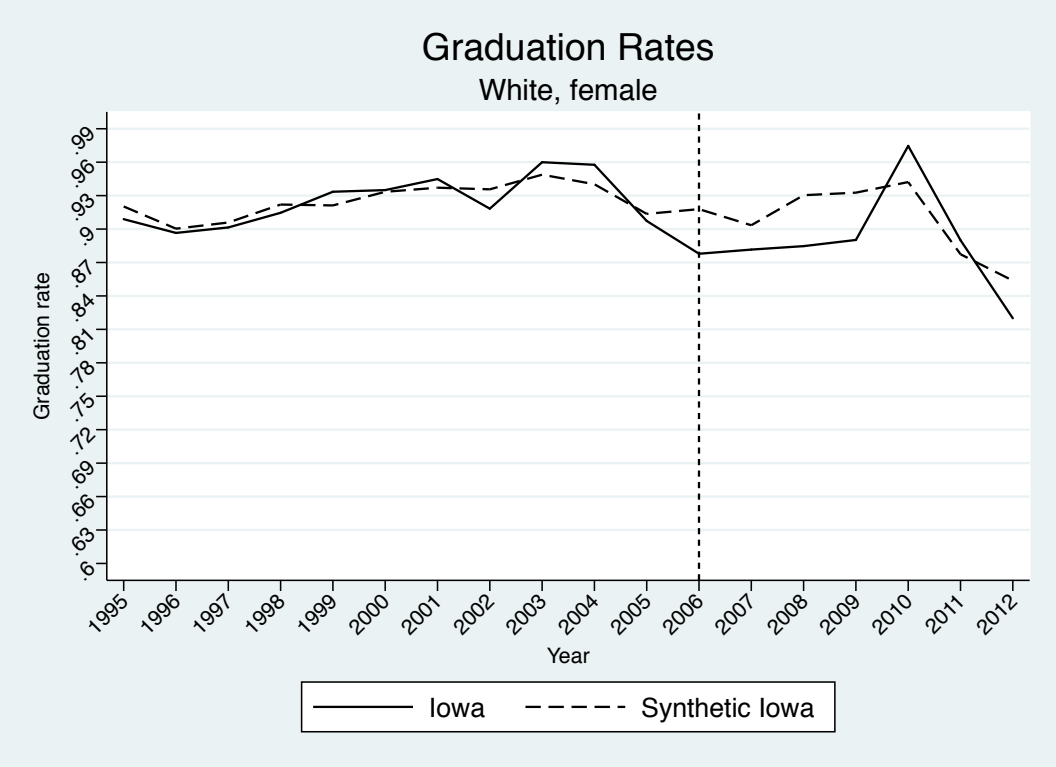

Graduation Rates
White, female
Graduation rate
.6
.63
.66
.69
.72
.75
.78
.81
.84
.87
.9
.93
.96
.99
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Year
Iowa
Synthetic Iowa

Figure 24

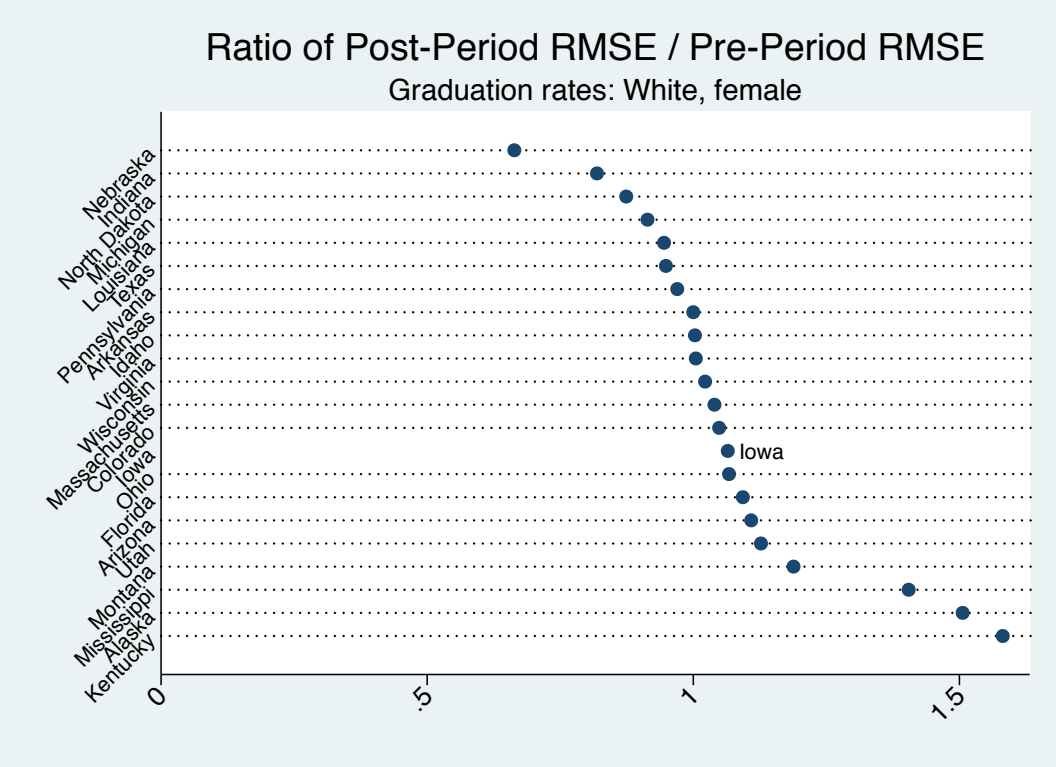

Ratio of Post-Period RMSE / Pre-Period RMSE
Graduation rates: White, female
Nebraska
Indiana
North Dakota
Michigan
Louisiana
Texas
Pennsylvania
Arkansas
Idaho
Virginia
Wisconsin
Massachusetts
Colorado
Iowa
Ohio
Florida
Arizona
Utah
Montana
Mississippi
Alaska
Kentucky
Iowa
0
.5
1
1.5

Figure 25

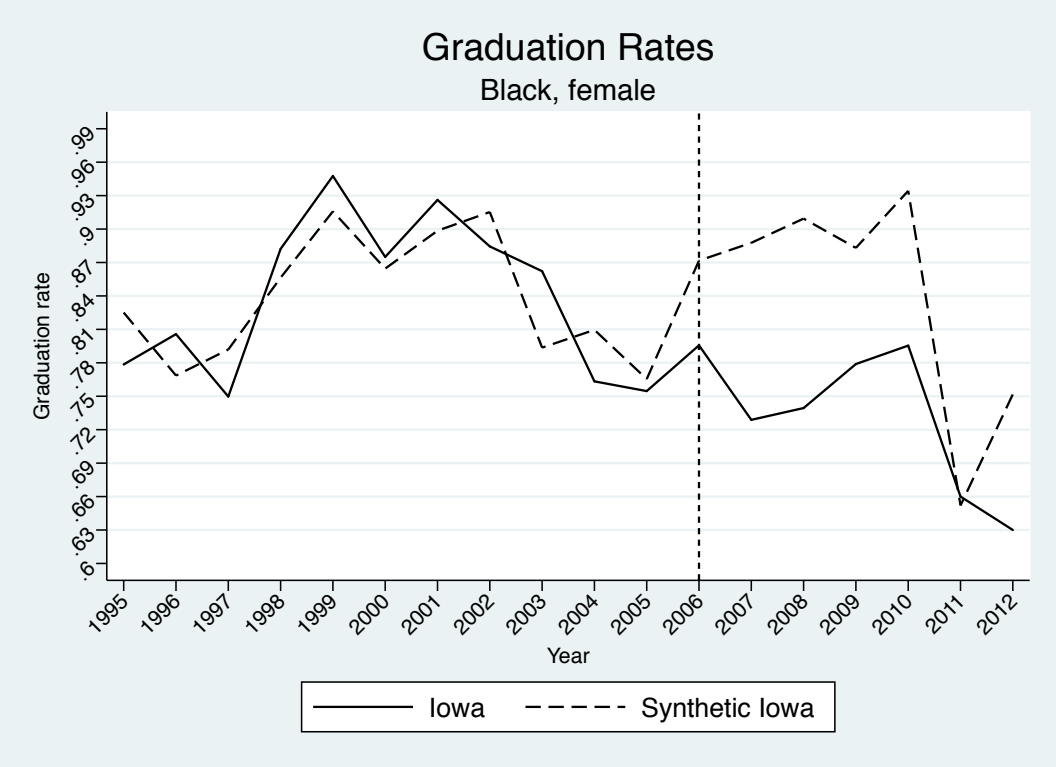

Graduation Rates
Black, female
Graduation rate
.6
.63
.66
.69
.72
.75
.78
.81
.84
.87
.9
.93
.96
.99
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Year
Iowa
Synthetic Iowa

Figure 26

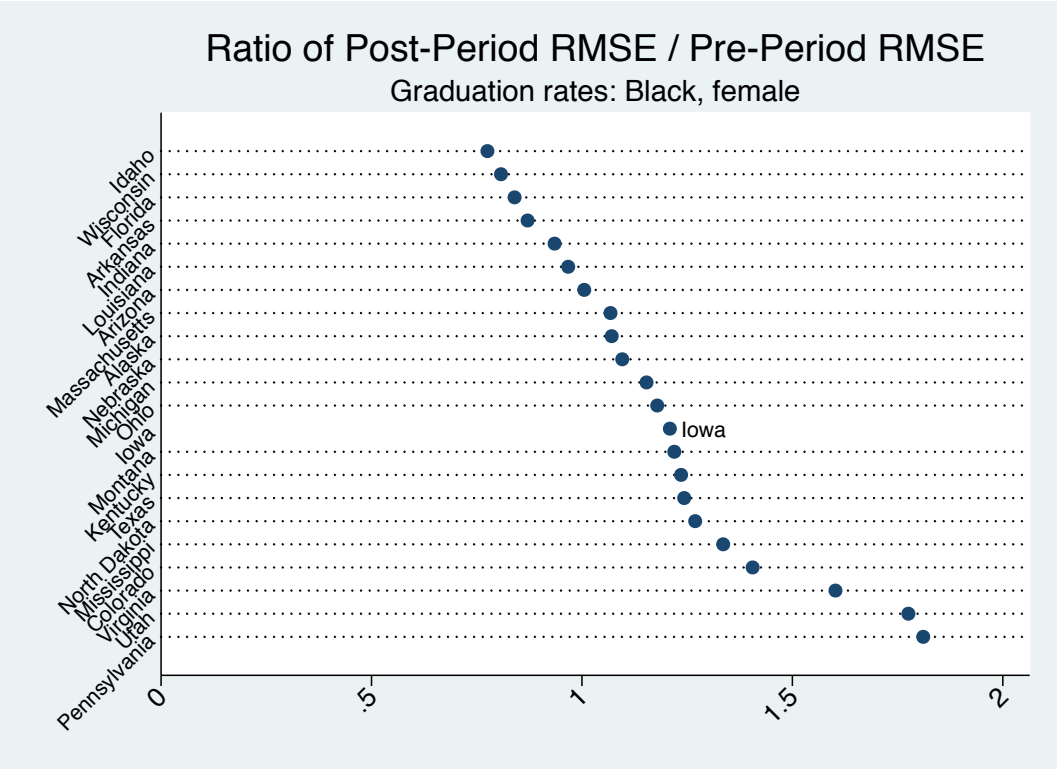

Ratio of Post-Period RMSE / Pre-Period RMSE
Graduation rates: Black, female
Idaho
Wisconsin
Florida
Arkansas
Indiana
Louisiana
Arizona
Massachusetts
Alaska
Nebraska
Michigan
Ohio
Iowa
Montana
Kentucky
Texas
North Dakota
Mississippi
Colorado
Virginia
Utah
Pennsylvania
Iowa
0
.5
1
1.5
2

Figure 27

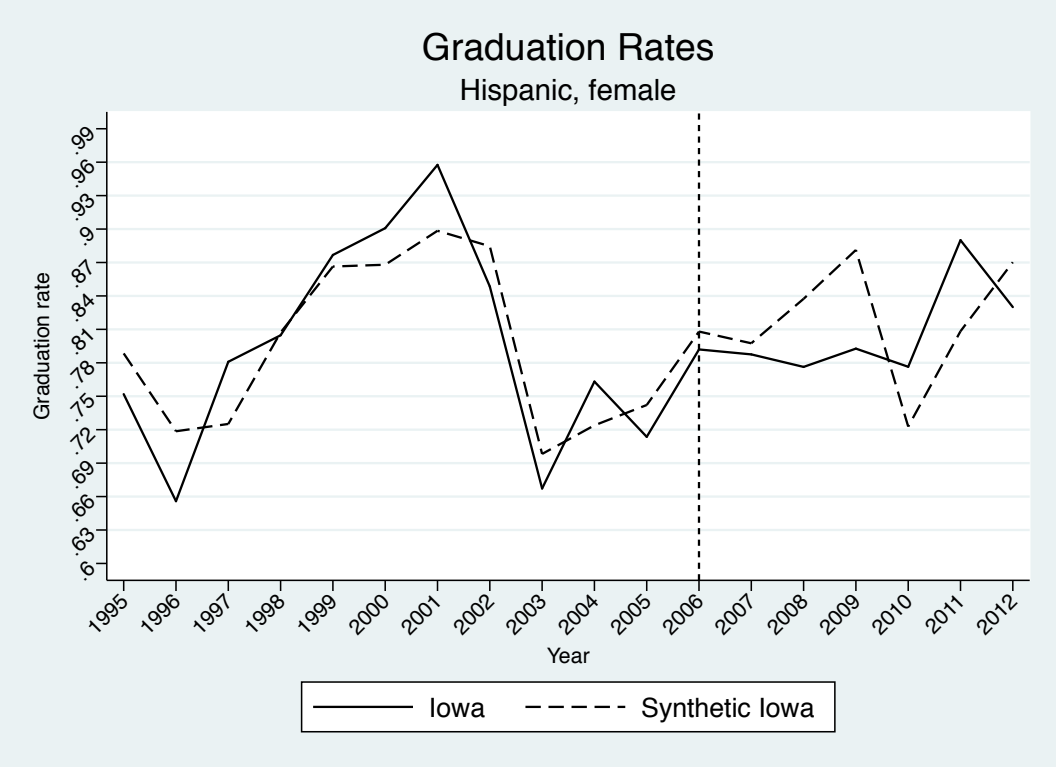

Graduation Rates
Hispanic, female
Graduation rate
.6
.63
.66
.69
.72
.75
.78
.81
.84
.87
.9
.93
.96
.99
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Year
Iowa
Synthetic Iowa

Figure 28

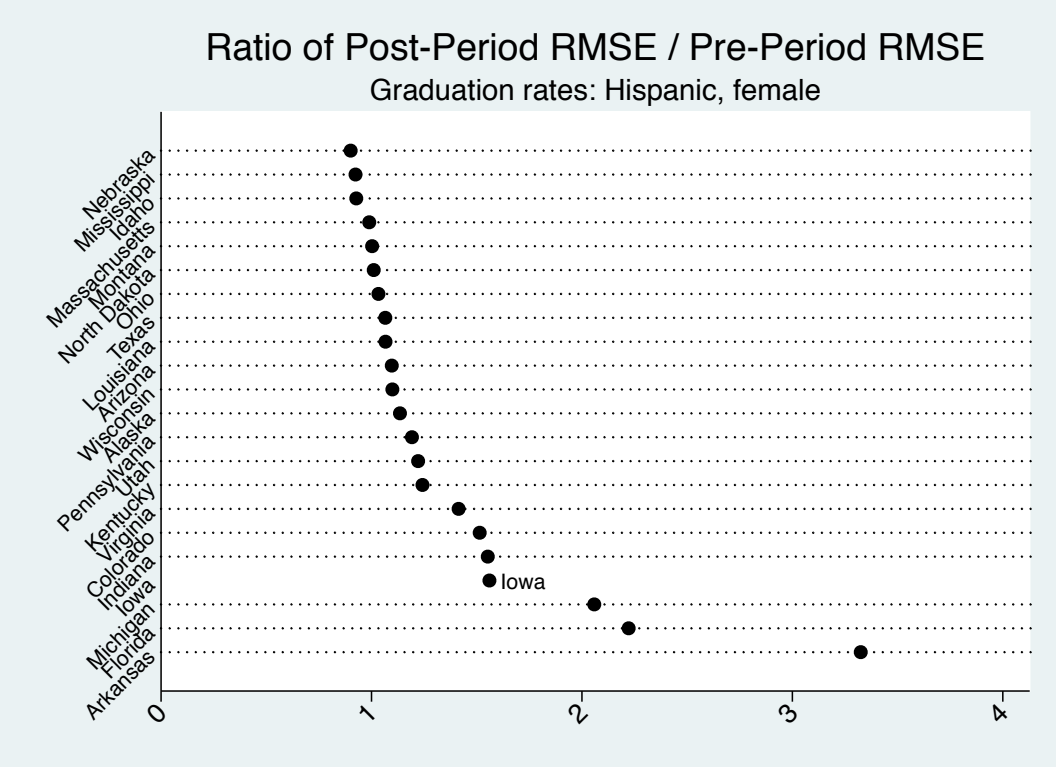
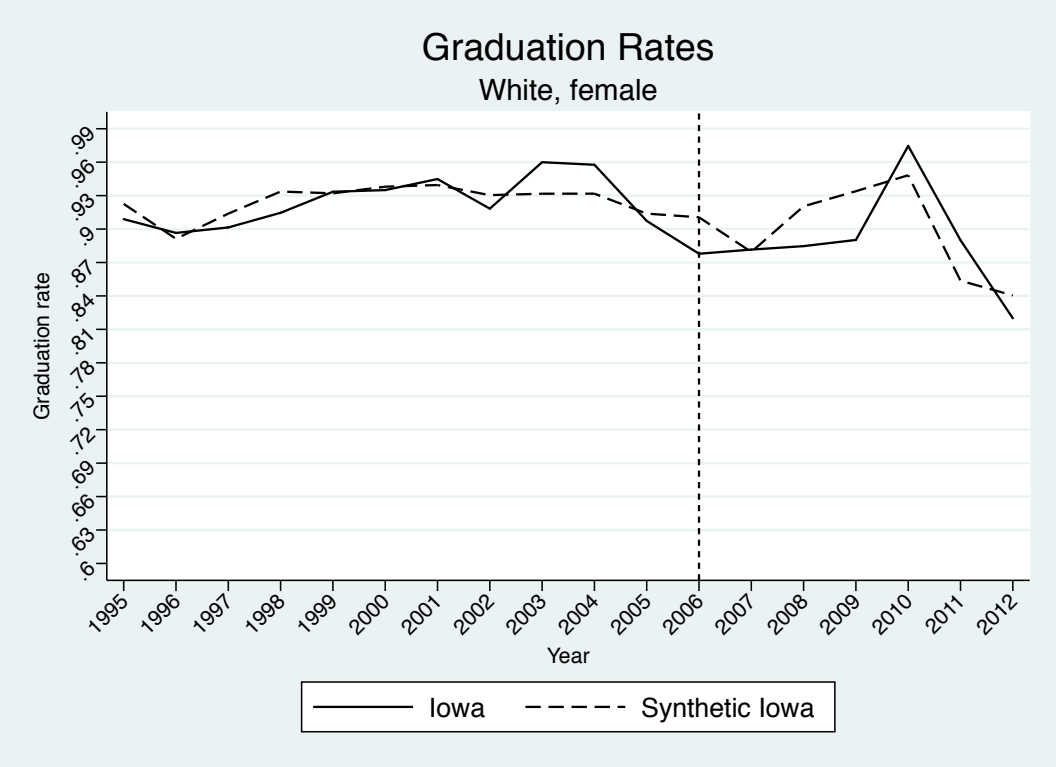
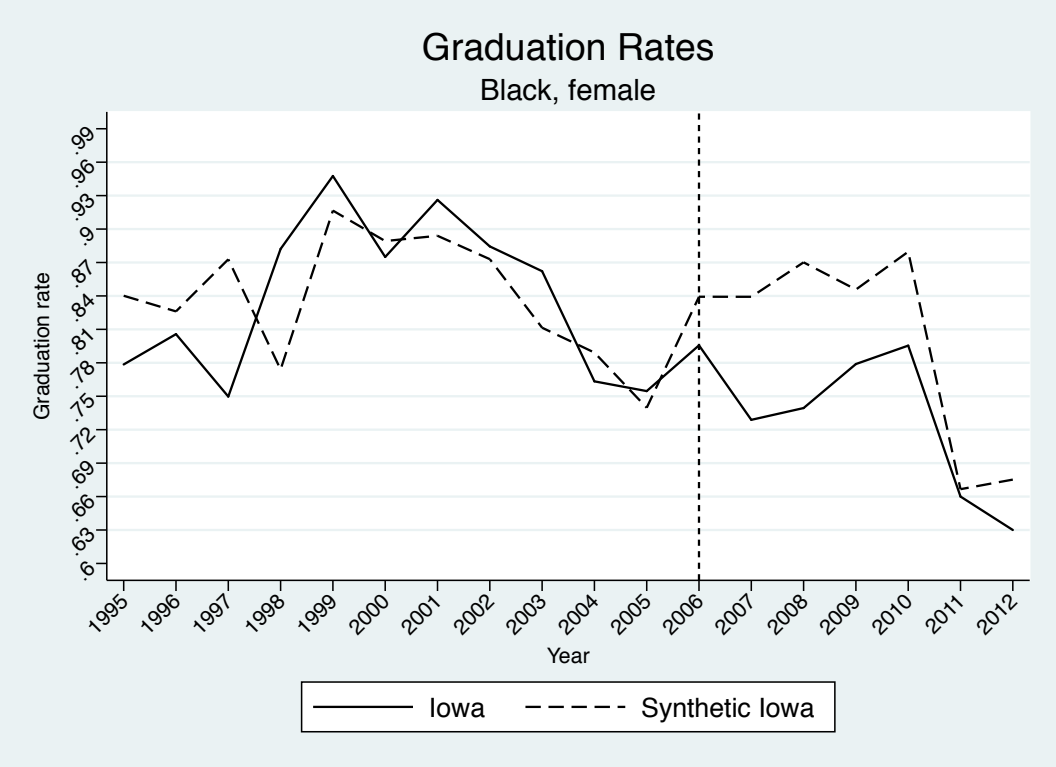

Ratio of Post-Period RMSE / Pre-Period RMSE
Graduation rates: Hispanic, female
Nebraska
Mississippi
Idaho
Massachusetts
Montana
North Dakota
Ohio
Texas
Louisiana
Arizona
Wisconsin
Alaska
Pennsylvania
Utah
Kentucky
Virginia
Colorado
Indiana
Iowa
Michigan
Florida
Arkansas
Iowa
0
1
2
3
4

Figure 29



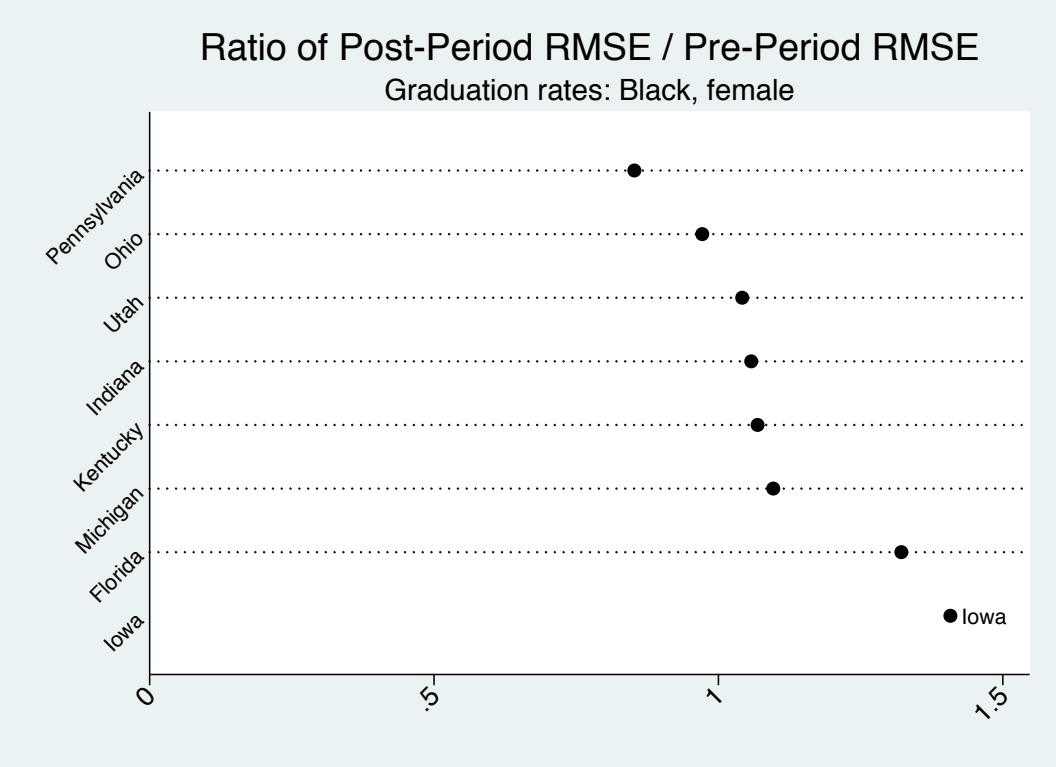
Notes: This graph depicts the synthetic control when using only states with abstinence-only sex education (i.e. the smaller donor pool).

Figure 30



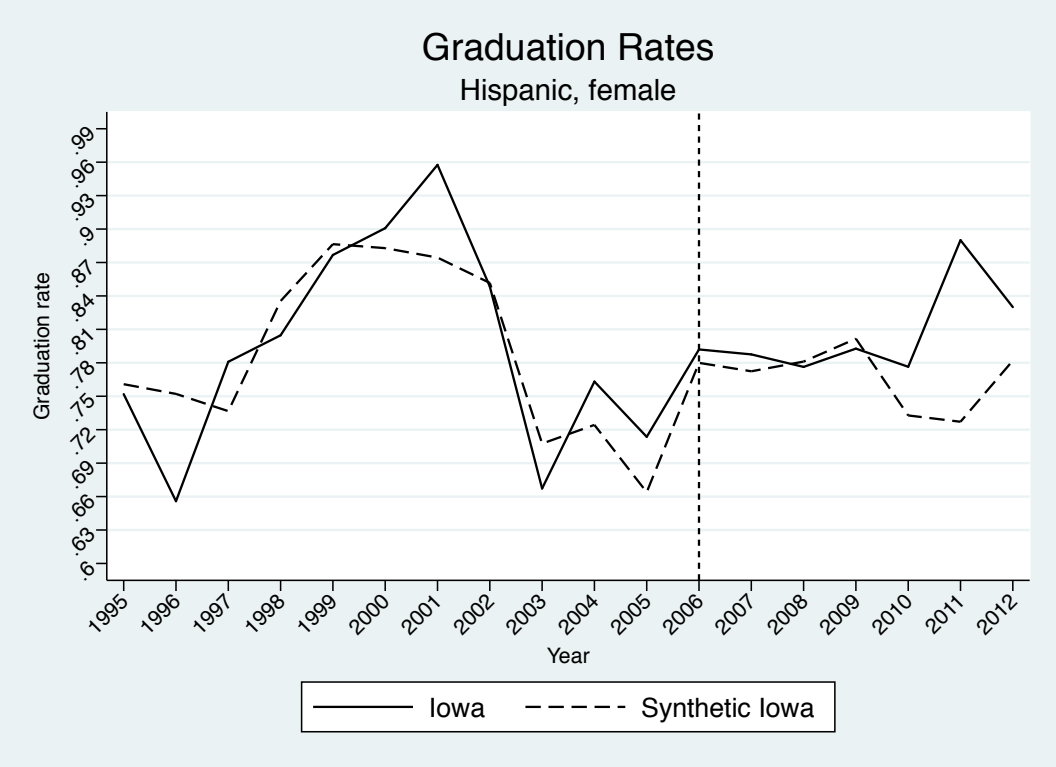
Notes: This graph depicts the synthetic control when using only states with abstinence-only sex education (i.e. the smaller donor pool).

Figure 31



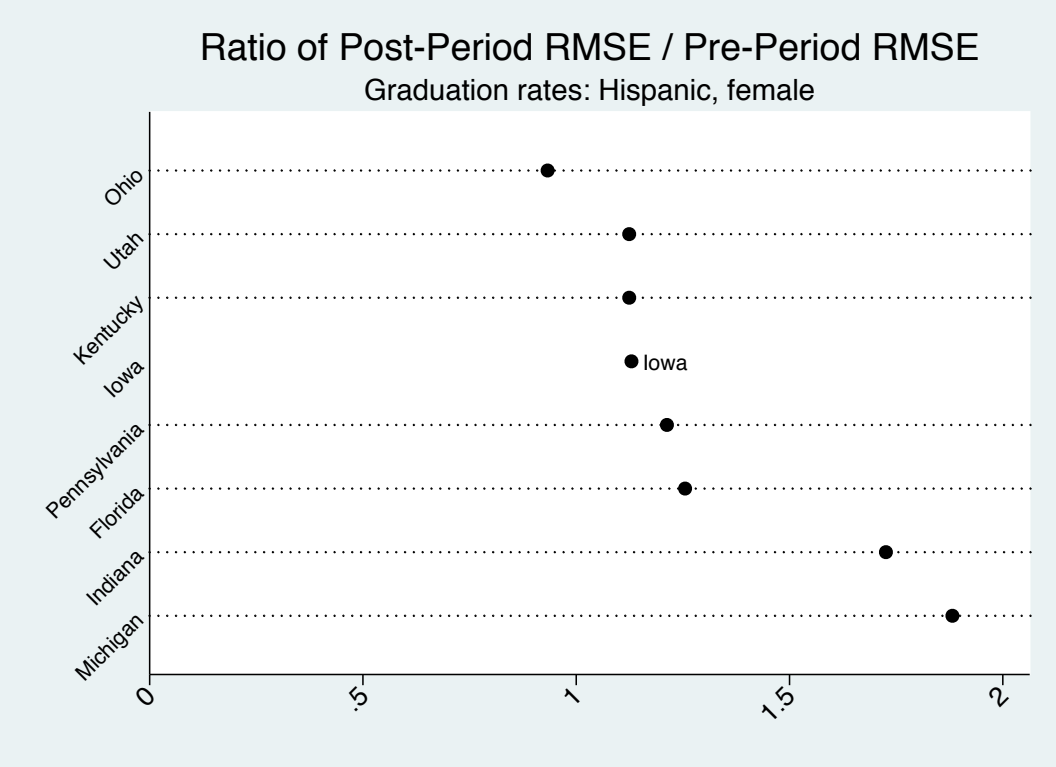
Notes: This graph depicts the synthetic control when using only states with abstinence-only sex education (i.e. the smaller donor pool).

Figure 32



Notes: This graph depicts the synthetic control when using only states with abstinence-only sex education (i.e. the smaller donor pool).

Figure 33



Notes: This graph depicts the synthetic control when using only states with abstinence-only sex education (i.e. the smaller donor pool).

APPENDIX

Appendix Table 1

Number of observations, imputation flags, & sources of data

Variable	N	Imputation	Source
Annual state-level unemployment rate	918		Bureau of Labor Statistics
Birth rate, Black, ages 15-19	918		Centers for Disease Control and Prevention WONDER dataset
Birth rate, Hispanic, ages 15-19	918		Centers for Disease Control and Prevention WONDER dataset
Birth rate, White, ages 15-19	918		Centers for Disease Control and Prevention WONDER dataset
Change in percentage Black population	918		Surveillance, Epidemiology, and End Results Program (SEER) Population Data[44]
Change in percentage Hispanic population	918		Surveillance, Epidemiology, and End Results Program (SEER) Population Data[45]
Gini Coefficient of Income Inequality[46]	936		Internal Revenue Service
Graduation rate, Black	918		Common Core of Data
Graduation rate, Black female	918	x	Common Core of Data
Graduation rates, Black male	918	x	Common Core of Data
Graduation rates, Hispanic	918		Common Core of Data
Graduation rates, Hispanic, female	918	x	Common Core of Data
Graduation rates, Hispanic, male	918	x	Common Core of Data
Graduation rates, White	918		Common Core of Data
Graduation rates, White female	918	x	Common Core of Data
Graduation rates, White, male	918	x	Common Core of Data

[44] Prepared by National Bureau of Economic Research.

[45] Prepared by National Bureau of Economic Research.

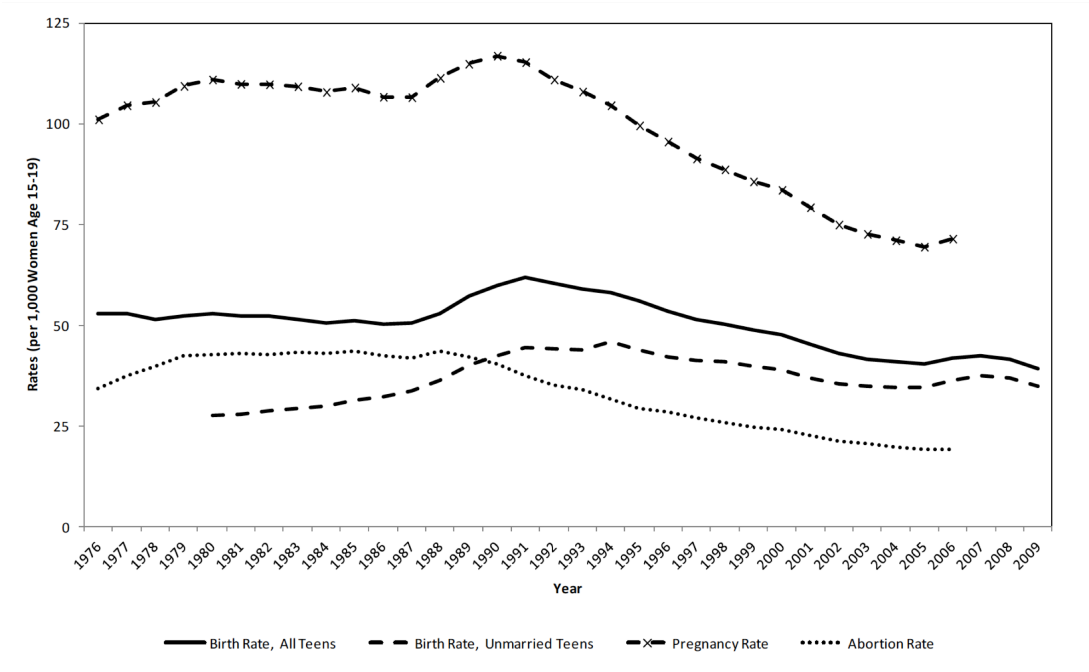
[46] Prepared by Mark Frank (http://www.shsu.edu/eco_mwf/inequality.html)

Inflation-adjusted per capita income (adjusted to 2013 dollars)	918		U.S. Census Bureau, Bureau of Economic Analysis[47]
Per pupil spending	918	x	Common Core of Data
Percentage population in poverty	918		Small Area Income and Poverty Estimates (U.S. Census Bureau)
Percentage of Population receiving food stamps	918		U.S. Census Bureau
Student-teacher ratio	918		Common Core of Data

Notes: Data was linearly interpolated for missing observations for states and/or years for variables indicated.

[47] Inflation factors from the Bureau of Economic Analyis provided through http://liberalarts.oregonstate.edu/spp/polisci/faculty-staff/robert-sahr/inflation-conversion-factors-years-1774-estimated-2024-dollars-recent-years/individual-year-conversion-factor-table-0

Appendix Figure 1



(Kearney & Levine, 2012b)

REFERENCES

Abadie, A., Diamond, A., & Hainmueller, J. (2010). Synthetic control methods for comparative case studies: Estimating the effect of California's tobacco control program. *Journal of the American Statistical Association*, *105*(490).

Abadie, A., Diamond, A., & Hainmueller, J. (2014). Comparative politics and the synthetic control method. *American Journal of Political Science*.

Abma, J. C., Martinez, G. M., Mosher, W. D., & Dawson, B. S. (2004). Teenagers in the United States: Sexual activity, contraceptive use, and childbearing, 2002. *Vital and Health Statistics. Series 23, Data from the National Survey of Family Growth*, (24), 1–48.

About School-Based Health Alliance - School-Based Health Alliance. (n.d.). Retrieved July 31, 2014, from http://www.sbh4all.org/site/c.ckLQKbOVLkK6E/b.7505827/k.2960/About_SchoolBased_Health_Alliance.htm

Acuña, R. (2015). *Occupied America: A history of Chicanos* (Eighth edition). Boston: Pearson.

Albouy, V., & Lequien, L. (2009). Does compulsory education lower mortality? *Journal of Health Economics*, *28*(1), 155–168.

Ali, M. M., & Dwyer, D. S. (2011). Estimating peer effects in sexual behavior among adolescents. *Journal of Adolescence*, *34*(1), 183–190. http://doi.org/10.1016/j.adolescence.2009.12.008

Amato, P. R., & Maynard, R. A. (2007). Decreasing nonmarital births and strengthening marriage to reduce poverty. *The Future of Children*, *17*(2), 117–141.

Amin, V., Behrman, J. R., & Spector, T. D. (2013). Does more schooling improve health outcomes and health related behaviors? Evidence from UK twins. *Economics of Education Review*, *35*, 134–148.

Arendt, J. N. (2005). Does education cause better health? A panel data analysis using school reforms for identification. *Economics of Education Review*, *24*(2), 149–160. http://doi.org/10.1016/j.econedurev.2004.04.008

Aparicio, E., Pecukonis, E. V., & Zhou, K. (2014). Sociocultural factors of teenage pregnancy in Latino communities: Preparing social workers for culturally responsive practice. *Health & Social Work*, 238–243.

Autor, D. H., Katz, L. F., & Kearney, M. S. (2005). Rising wage inequality: the role of composition and prices. *NBER Working Paper Series*, *11628*.

Basch, C. C. (2011). Teen pregnancy and the achievement gap among urban minority youth. *Journal of School Health*, *81*(10), 614–618.

Basch, C. E. (2011). Healthier students are better learners: A missing link in school reforms to close the achievement gap. *Journal of School Health*, *81*(10), 593–598.

Beauvoir, S. de, Borde, C., & Malovany-Chevallier, S. (2011). *The second sex*. New York: Vintage.

Belfield, C. R., & Levin, H. M. (2007). The Educational Attainment Gap: Who's Affected, How Much, and Why It Matters. In C. R. Belfield & H. M. Levin (Eds.), *The price we pay: Economic and social consequences of inadequate education* (pp. 1–20). Brookings Institution Press.

Belman, D., & Heywood, J. S. (1991). Sheepskin effects in the returns to education: An examination of women and minorities. *The Review of Economics and Statistics*, 720–724.

Bernal, D. D. (2002). Critical race theory, Latino critical theory, and critical raced-gendered epistemologies: Recognizing students of color as holders and creators of knowledge. *Qualitative Inquiry*, *8*(1), 105–126.

Biggs, M. A., Ralph, L., Minnis, A. M., Arons, A., Marchi, K. S., Lehrer, J. A., … Brindis, C. D. (2010). Factors associated with delayed childbearing: From the voices of expectant Latina adults and teens in California. *Hispanic Journal of Behavioral Sciences*, *32*(1), 77–103.

Bitzan, J. D. (2009). Do sheepskin effects help explain racial earnings differences? *Economics of Education Review*, *28*(6), 759–766.

Black, S. E., Devereux, P. J., & Salvanes, K. G. (2008). Staying in the Classroom and out of the maternity ward? The effect of compulsory schooling laws on teenage births. *The Economic Journal*, *118*(530), 1025–1054.

Boesel, D., Alsalam, N., & Smith, T. M. (1998). *Educational and Labor Market Performance of GED Recipients. Research Synthesis.* (No. NLE-98-2023). Washington, D.C.: National Library of Education.

Bourdieu, P. (1977). *Reproduction in education, society and culture*. London: Sage Publications.

Braakmann, N. (2011). The causal relationship between education, health and health related behaviour: Evidence from a natural experiment in England. *Journal of Health Economics*, *30*(4), 753–763.

Brand, J. E., & Xie, Y. (2010). Who benefits most from college? Evidence for negative selection in heterogeneous economic returns to higher education. *American Sociological Review*, *75*(2), 273–302.

Braveman, P. A., Cubbin, C., Egerter, S., Williams, D. R., & Pamuk, E. (2010). Socioeconomic disparities in health in the United States: What the patterns tell us. *American Journal of Public Health*, *100*(S1), S186–S196. http://doi.org/10.2105/AJPH.2009.166082

Brindis, C., & Philliber, S. (1998). Room to grow: Improving services for pregnant and parenting teenagers in school settings. *Education and Urban Society*, *30*(2), 242–60.

Britzman, D. P. (1998). *Lost subjects, contested objects: toward a psychoanalytic inquiry of learning*. Albany: State University of New York Press.

Broader, BOLDER Approach to Education: Home. (2014). Retrieved February 9, 2014, from http://www.boldapproach.org/

Brooks-Gunn, J., Guo, G., & Furstenberg Jr, F. F. (1993). Who drops out of and who continues beyond high school? A 20-year follow-up of black urban youth. *Journal of Research on Adolescence*, *3*(3), 271–294.

Butler, J. (2011). *Bodies that matter: On the discursive limits of "sex."* Abingdon, Oxon ; New York, NY: Routledge.

Butler, J. (2006). *Gender trouble: feminism and the subversion of identity*. New York: Routledge.

California Department of Public Health. (2014). Legislative Mandate for Tobacco Control - Proposition 99. Retrieved August 20, 2014, from http://www.cdph.ca.gov/programs/tobacco/Pages/CTCPLegislativeMandateforTobaccoControl-Prop99.aspx

Cameron, A. C., & Trivedi, P. K. (2010). *Microeconometrics using Stata*. College Station, Tex: Stata Press.

Cameron, S. V., & Heckman, J. J. (1991). *The nonequivalence of high school equivalents* (No. 3804). National Bureau of Economic Research.

Card, D. (1999). The causal effect of education on earnings. *Handbook of Labor Economics*, *3*, 1801–1863.

Card, D., & Krueger, A. B. (1991). *School quality and black-white relative earnings: A direct assessment*. National Bureau of Economic Research.

Carnoy, M., Elmore, R., & Siskin, L. (2013). *The new accountability: High schools and high-stakes testing*. Routledge.

Chapman, C., Laird, J., Ifill, N., & Kewal Ramani, A. (2011). *Trends in High School Dropout and Completion Rates in the United States: 1972–2009* (No. NCES 2012-006).

Washington, D.C: U.S. Department of Education, National Center for Education Statistics. Retrieved from http://nces.ed.gov/pubsearch

Chin, H. B., Sipe, T. A., Elder, R., Mercer, S. L., Chattopadhyay, S. K., Jacob, V., … Griffith, M. (2012). The effectiveness of group-based comprehensive risk-reduction and abstinence education interventions to prevent or reduce the risk of adolescent pregnancy, human immunodeficiency virus, and sexually transmitted infections: two systematic reviews for the Guide to Community Preventive Services. *American Journal of Preventive Medicine*, *42*(3), 272–294.

Collins, P. H. (2000). *Black feminist thought: Knowledge, consciousness, and the politics of empowerment*. Psychology Press.

Comer, J. P. (1997). *Waiting for a miracle: why schools can't solve our problems--and how we can*. New York: Dutton.

Common Core of Data (CCD). (2014). Retrieved February 9, 2014, from https://nces.ed.gov/ccd/

Constantine, J., Ponza, M., Seftor, N., & Cody, S. (2013). What Works Clearinghouse Procedures and Standards Handbook, Version 3.0. Institute of Education Sciences. Retrieved from http://ies.ed.gov.libproxy.lib.unc.edu/ncee/wwc/pdf/reference_resources/wwc_procedures_v3_0_draft_standards_handbook.pdf

Consumer Price Index (CPI). (n.d.). [Bureau of Labor Statistics]. Retrieved March 16, 2015, from http://www.bls.gov/cpi/data.htm

Conti, G., & Hansman, C. (2013). Personality and the education–health gradient: A note on understanding differences in health behaviors by education. *Journal of Health Economics*, *32*(2), 480–485.

Conti, G., & Heckman, J. J. (2010). Understanding the early origins of the education-health gradient: A framework that can also be applied to analyze gene-environment interactions. *Perspectives on Psychological Science*, *5*(5), 585–605. http://doi.org/10.1177/1745691610383502

Cowell, F. A., & Mehta, F. (1982). The estimation and interpolation of inequality measures. *The Review of Economic Studies*, *49*(2), 273–290.

Coyle, K. K., Kirby, D. B., Marín, B. V., Gómez, C. A., & Gregorich, S. E. (2004). Draw the Line/Respect the Line: A randomized trial of a middle school intervention to reduce sexual risk behaviors. *American Journal of Public Health*, *94*(5), 843–851.

Crenshaw, K. (1991). Mapping the margins: Intersectionality, identity politics, and violence against women of color. *Stanford Law Review*, 1241–1299.

Cunningham, S., & Shah, M. (2014). *Decriminalizing indoor prostitution: Implications for sexual violence and public health* (No. w20281). National Bureau of Economic Research.

Cutler, D. M., & Lleras-Muney, A. (2010). Understanding differences in health behaviors by education. *Journal of Health Economics*, *29*(1), 1–28.

Dash, L. (1986). Black teenage pregnancy in Washington, DC. *International Social Science Review*, 169–176.

Dehejia, R. H., & Wahba, S. (1999). Causal effects in nonexperimental studies: Reevaluating the evaluation of training programs. *Journal of the American Statistical Association*, *94*(448), 1053–1062.

Denny, G., & Young, M. (2006). An evaluation of an abstinence-only sex education curriculum: An 18-month follow-up. *Journal of School Health*, *76*(8), 414–422.

Denny, K. J., & Harmon, C. P. (2001). Testing for sheepskin effects in earnings equations: evidence for five countries. *Applied Economics Letters*, *8*(9), 635–637.

Dobbie, W., & Fryer Jr, R. G. (2009). *Are high quality schools enough to close the achievement gap? Evidence from a social experiment in Harlem* (No. 15473). National Bureau of Economic Research. Retrieved from http://www.nber.org/papers/w15473

Dobbie, W., & Fryer Jr, R. G. (2011). *Getting beneath the veil of effective schools: Evidence from New York City* (No. 17632). National Bureau of Economic Research. Retrieved from http://www.nber.org/papers/w17632

Dodson, L. (1999). *Don't call us out of name the untold lives of women and girls in poor America*. Boston, Mass.: Beacon Press.

Duncan, G. J., & Murnane, R. J. (2011). Introduction: The American Dream, Then and Now. In G. J. Duncan & R. J. Murnane (Eds.), *Whither opportunity?: rising inequality, schools, and children's life chances* (pp. 3–23). New York : Chicago: Russell Sage Foundation ; Spencer Foundation.

Edin, K., & Kefalas, M. (2005). *Promises I can keep: why poor women put motherhood before marriage*. Berkeley: University of California Press.

Ehrlich, J. S. (2006). From age of consent laws to the silver ring rhing: The regulation of adolescent female sexuality. *Health Matrix*, *16*, 151–181.

Eide, E. R., & Showalter, M. H. (2011). Estimating the relation between health and education: What do we know and what do we need to know? *Economics of Education Review*, *30*(5), 778–791.

Eide, E. R., Showalter, M. H., & Goldhaber, D. D. (2010). The relation between children's health and academic achievement. *Children and Youth Services Review*, *32*(2), 231–238. http://doi.org/10.1016/j.childyouth.2009.08.019

Elo, I. T. (2009). Social class differentials in health and mortality: Patterns and explanations in comparative perspective. *Annual Review of Sociology*, *35*(1), 553–572. http://doi.org/10.1146/annurev-soc-070308-115929

Elo, I. T., & Preston, S. H. (1996). Educational differentials in mortality: United States, 1979–1985. *Social Science & Medicine*, *42*(1), 47–57.

ELSI - Elementary and Secondary Information System. (2015, February 17). [.gov]. Retrieved February 17, 2015, from http://nces.ed.gov/ccd/elsi/

Emihovich, C., & Herrington, C. D. (1997). *Sex, kids, and politics: health services in schools*. New York: Teachers College Press.

Erkut, S., Grossman, J. M., Frye, A. A., Ceder, I., Charmaraman, L., & Tracy, A. J. (2013). Can sex education delay early sexual debut? *The Journal of Early Adolescence*, *33*(4), 482–497. http://doi.org/10.1177/0272431612449386

Fields, J. (2008). *Risky lessons: Sex education and social inequality*. Rutgers University Press.

Fine, M. (2003a). Sexuality, schooling, and adolescent females: The missing discourse of desire. In M. Fine & L. Weis (Eds.), *Silenced voices and extraordinary conversations: re-imagining schools* (pp. 38–67). New York: Teachers College Press.

Fine, M. (2003b). Silencing and nurturing voice in an improbable context: Urban adolescents in pulic school. In M. Fine & L. Weis (Eds.), *Silenced voices and extraordinary conversations: re-imagining schools* (pp. 13–37). New York: Teachers College Press.

Folbre, N., & Abel, M. (1989). Women's work and women's households: Gender bias in the US census. *Social Research*, 545–569.

Foucault, M. (1971). The discourse on language. *Truth: Engagements Across Philosophical Traditions*, 315–335.

Foucault, M. (1990). *The history of sexuality, volume I : an introduction* (Vintage Books ed.). New York: Random House.

Frank, M. W. (2009). Inequality and growth in the United States: Evidence from a state-level panel of income inequality measures. *Economic Inquiry*, *47*(1), 55–68. http://doi.org/10.1111/j.1465-7295.2008.00122.x

Freudenberg, N., & Ruglis, J. (2007). Reframing school dropout as a public health issue. *Preventing Chronic Disease: Public Health Research, Practice, and Policy*, *4*(4), 1–11.

Gastwirth, J. L. (1972). The estimation of the Lorenz curve and Gini index. *The Review of Economics and Statistics*, 306–316.

Geronimus, A. T., & Korenman, S. (1992). The socioeconomic consequences of teen childbearing reconsidered. *The Quarterly Journal of Economics*, *107*(4), 1187–1214.

Gilbert, J. (2014). *Sexuality in school: the limits of education*. Minneapolis: University Of Minnesota Press.

Gilligan, C., Lyons, N., & Hanmer, T. J. (Eds.). (1990). *Making connections: the relational worlds of adolescent girls at Emma Willard School*. Cambridge, Mass: Harvard University Press.

Goldfarb, E. S., & McCaffree, K. (2000). Toward a More Effective Pedagogy for Sexuality Education: The Establishment of Democratic Classrooms. *Journal of Sex Education & Therapy*, *25*.

Goldman, D., & Smith, J. P. (2011). The increasing value of education to health. *Social Science & Medicine*, *72*(10), 1728–1737. http://doi.org/10.1016/j.socscimed.2011.02.047

Groot, W., & Maassen van den Brink, H. (2007). The health effects of education. *Economics of Education Review*, *26*(2), 186–200.

Grossman, M. (1972). On the concept of health capital and the demand for health. *The Journal of Political Economy*, 223–255.

Hahn, J., & Hausman, J. (2002). A new specification test for the validity of instrumental variables. *Econometrica*, *70*(1), 163–189.

Harlem Children's Zone. (2014). Retrieved February 9, 2014, from http://www.hcz.org/

Harris, C. I. (1993). Whiteness as property. *Harvard Law Review*, *106*(8), 1707–1791. http://doi.org/10.2307/1341787

Heckman, J. J., & LaFontaine, P. (2006). *Bias corrected estimates of GED returns*. National Bureau of Economic Research.

Heckman, J. J., & LaFontaine, P. A. (2010). The American high school graduation rate: trends and levels. *The Review of Economics and Statistics*, *92*(2), 244–262.

Heckman, J. J., Lochner, L. J., & Todd, P. E. (2008). *Earnings functions and rates of return* (No. 13780). National Bureau of Economic Research. Retrieved from http://www.nber.org/papers/w13780

Henderson, D. J., Polachek, S. W., & Wang, L. (2011). Heterogeneity in schooling rates of return. *Economics of Education Review*, *30*(6), 1202–1214.

Hewitt, N. A. (Ed.). (2010). *No permanent waves: recasting histories of U.S. feminism*. New Brunswick, N.J: Rutgers University Press.

Hofferth, S., & Hayes, C. D. (Eds.). (1987). *Risking the future: Adolescent sexuality, pregnancy, and childbearing* (Vol. 1). Washington, D.C.: Natl Academy Press.

Hofferth, S. L., & Reid, L. (2002). Early childbearing and children's achievement and behavior over time. *Perspectives on Sexual and Reproductive Health*, 41–49.

Hofferth, S. L., Reid, L., & Mott, F. L. (2001). The effects of early childbearing on schooling over time. *Family Planning Perspectives*, 259–267.

Hoffman, S. D. (2006). By the numbers: The public costs of adolescent childbearing. *Washington, DC: The National Campaign to Prevent Teen Pregnancy*.

Hoffman, S. D., & Maynard, R. A. (Eds.). (2008). *Kids having kids: Economic costs and social consequences of teen pregnancy* (2nd ed.). Washington, D.C.: The Urban Institute Press.

Horwitz, S. M., Klerman, L. V., Kuo, H. S., & Jekel, J. F. (1991). School-age mothers: Predictors of long-term educational and economic outcomes. *Pediatrics*, *87*(6), 862–868.

Hout, M., & Janus, A. (2011). Educational Mobility in the United States Since the 1930s. In G. J. Duncan & R. J. Murnane (Eds.), *Whither opportunity?: rising inequality, schools, and children's life chances* (pp. 165–186). New York: Russell Sage Foundation ; Spencer Foundation.

Human growth and development instruction., Iowa Code 279.50. Retrieved from http://search.legis.state.ia.us/NXT/gateway.dll/ic/1/13/9253/10185/10323/10382?f=templates$fn=default.htm$q=[field%20%20279.50]$x=Advanced#LPHit1

Hungerford, T., & Solon, G. (1987). Sheepskin effects in the returns to education. *The Review of Economics and Statistics*, 175–177.

Hunt-McCool, J., & Bishop, D. M. (1998). Health economics and the economics of education: specialization and division of labor. *Economics of Education Review*, *17*(3), 237–244. http://doi.org/10.1016/S0272-7757(97)00045-9

Hyams, M. S. (2000). " Pay attention in class...[and] don't get pregnant": A discourse of academic success among adolescent Latinas. *Environment and Planning A*, *32*(4), 635–654.

Individual Year Conversion Factor Tables | College of Liberal Arts | Oregon State University. (n.d.). Retrieved January 27, 2015, from

http://liberalarts.oregonstate.edu/spp/polisci/faculty-staff/robert-sahr/inflation-conversion-factors-years-1774-estimated-2024-dollars-recent-years/individual-year-conversion-factor-table-0

Irvine, J. M. (2000). Doing it with words: Discourse and the sex education culture wars. *Critical Inquiry*, 58–76.

Isley, M. M., Edelman, A., Kaneshiro, B., Peters, D., Nichols, M. D., & Jensen, J. T. (2010). Sex education and contraceptive use at coital debut in the United States: Results from Cycle 6 of the National Survey of Family Growth. *Contraception*, *82*(3), 236–242. http://doi.org/10.1016/j.contraception.2010.03.019

Johnson, B. T., Scott-Sheldon, L. A., Huedo-Medina, T. B., & Carey, M. P. (2011). Interventions to reduce sexual risk for human immunodeficiency virus in adolescents: a Meta-analysis of trials, 1985-2008. *Archives of Pediatrics & Adolescent Medicine*, *165*(1), 77–84.

Jones, J. H. (1993). *Bad blood: the Tuskegee syphilis experiment*. New York: Free Press.

Jürges, H., Reinhold, S., & Salm, M. (2011). Does schooling affect health behavior? Evidence from the educational expansion in Western Germany. *Special Issue on Education and Health*, *30*(5), 862–872. http://doi.org/10.1016/j.econedurev.2011.04.002

Kane, T. J., & Rouse, C. E. (1993). *Labor market returns to two-and four-year colleges: Is a credit a credit and do degrees matter?* (No. 4268). National Bureau of Economic Research.

Kaplan, E. B. (1997). *Not our kind of girl: unraveling the myths of black teenage motherhood*. Berkeley: University of California Press.

Kawachi, I., Adler, N. E., & Dow, W. H. (2010). Money, schooling, and health: Mechanisms and causal evidence. *Annals of the New York Academy of Sciences*, *1186*(1), 56–68.

Kearney, M. S., & Levine, P. B. (2012a). *Explaining recent trends in the US teen birth rate* (No. 17964). National Bureau of Economic Research.

Kearney, M. S., & Levine, P. B. (2012b). *Why is the teen birth rate in the United States so high and why does it matter?* (No. 17965). National Bureau of Economic Research.

Kenkel, D. S., Lillard, D. R., & Mathios, A. D. (2006). *The roles of high school completion and GED receipt in smoking and obesity* (No. 11990). National Bureau of Economic Research. Retrieved from http://www.nber.org/papers/w11990

Kimbro, R. T., Bzostek, S., Goldman, N., & Rodríguez, G. (2008). Race, ethnicity, and the education gradient in health. *Health Affairs*, *27*(2), 361–372.

Kirby, D. (2001). *Emerging Answers: Research findings on programs to reduce teen pregnancy*. Washington, D.C.: National Campaign To Prevent Teen Pregnancy.

Kirby, D. B. (2008). The impact of abstinence and comprehensive sex and STD/HIV education programs on adolescent sexual behavior. *Sexuality Research & Social Policy*, *5*(3), 18–27.

Kitagawa, E. M., & Hauser, P. M. (1973). *Differential mortality in the United States: A study in socioeconomic epidemiology* (Vol. 35). Harvard University Press Cambridge, MA.

Klepinger, D. H., Lundberg, S., & Plotnick, R. D. (1995). Adolescent fertility and the educational attainment of young women. *Family Planning Perspectives*, *27*(1), 23–28. http://doi.org/10.2307/2135973

Kling, J. R., Liebman, J. B., & Katz, L. F. (2007). Experimental analysis of neighborhood effects. *Econometrica*, *75*(1), 83–119.

Kohler, P. K., Manhart, L. E., & Lafferty, W. E. (2008). Abstinence-only and comprehensive sex education and the initiation of sexual activity and teen pregnancy. *Journal of Adolescent Health*, *42*(4), 344–351.

Kost, K., & Henshaw, S. (2013). *U.S. Teenage Pregnancies, Births and Abortions, 2008: State Trends by Age, Race and Ethnicity*. New York: Guttmacher Institute. Retrieved from http://www.guttmacher.org/pubs/USTPtrends13.pdf

Krieger, N., Williams, D. R., & Moss, N. E. (1997). Measuring social class in US public health research: Concepts, methodologies, and guidelines. *Annual Review of Public Health*, *18*(1), 341–378.

Ladd, H. F. (2012). Education and poverty: Confronting the evidence. *Journal of Policy Analysis and Management*, *31*(2), 203–227.

Ladd, H. F., Noguera, P., & Payzant, T. (2014). *Broader, Bolder Approach to Education Mission Statement* (pp. 1–5). A Broader, Bolder Approach to Education. Retrieved from http://www.epi.org/files/2011/bold_approach_full_statement-3.pdf

Ladson-Billings, G. (1998). Just what is critical race theory and what's it doing in a nice field like education? *International Journal of Qualitative Studies in Education*, *11*(1), 7–24. http://doi.org/10.1080/095183998236863

Lakoff, G. (2009). *The political mind: a cognitive scientist's guide to your brain and its politics*. New York: Penguin Books.

LaLonde, R. J. (1986). Evaluating the econometric evaluations of training programs with experimental data. *The American Economic Review*, 604–620.

Lamb, S., & Peterson, Z. D. (2012). Adolescent girls' sexual empowerment: Two feminists explore the concept. *Sex Roles*, *66*(11-12), 703–712. http://doi.org/10.1007/s11199-011-9995-3

Landry, D. J., Kaeser, L., & Richards, C. L. (1999). Abstinence promotion and the provision of information about contraception in public school district sexuality education policies. *Family Planning Perspectives*, 280–286.

Lauderdale, D. S. (2001). Education and survival: Birth cohort, period, and age effects. *Demography*, *38*(4), 551–561. http://doi.org/10.2307/3088318

Lee, J., & Hahm, H. C. (2010). Acculturation and sexual risk behaviors among Latina adolescents transitioning to young adulthood. *Journal of Youth and Adolescence*, *39*(4), 414–427.

Leigh, J. P. (1983). Direct and indirect effects of education on health. *Social Science & Medicine*, *17*(4), 227–234.

Levin, B. (2013). What Does It Take to Scale Up Innovations? An Examination of Teach for America, the Harlem Children's Zone and the Knowledge is Power Program. *National Education Policy Center*.

Levine, D. I., & Painter, G. (2003). The schooling costs of teenage out-of-wedlock childbearing: Analysis with a within-school propensity-score-matching estimator. *Review of Economics and Statistics*, *85*(4), 884–900.

Lewis, O. (1966). The culture of poverty. *Scientific American*, *215*(4), 19–25.

Lindberg, L. D., & Maddow-Zimet, I. (2012). Consequences of sex education on teen and young adult sexual behaviors and outcomes. *Journal of Adolescent Health*, *51*(4), 332–338.

Lochner, L., & Moretti, E. (2001). *The effect of education on crime: Evidence from prison inmates, arrests, and self-reports* (No. 8605). National Bureau of Economic Research.

Lord, A. M. (2010). *Condom nation: the U.S. government's sex education campaign from World War I to the Internet*. Baltimore: Johns Hopkins University Press.

Luker, K. (1985). *Abortion and the politics of motherhood*. Berkeley: University of California Press.

Luker, K. (2007). *When sex goes to school : warring views on sex--and sex education--since the sixties* (1st ed.). New York: W.W. Norton & Co.

Luttrell, W. (2003). *Pregnant bodies, fertile minds: gender, race, and the schooling of pregnant teens*. New York: Routledge.

Manlove, J. (1998). The influence of high school dropout and school disengagement on the risk of school-age pregnancy. *Journal of Research on Adolescence*, *8*(2), 187–220.

Marcotte, D. E. (2013). High school dropout and teen childbearing. *Economics of Education Review*, *34*, 258–268.

Markham, C. M., Tortolero, S. R., Peskin, M. F., Shegog, R., Thiel, M., Baumler, E. R., … Robin, L. (2012). Sexual risk avoidance and sexual risk reduction interventions for middle school youth: A randomized controlled trial. *Journal of Adolescent Health*, *50*(3), 279–288. http://doi.org/10.1016/j.jadohealth.2011.07.010

Marshall, C. (Ed.). (1997). *Feminist critical policy analysis*. London; Washington D.C.: Falmer Press.

Mayo, C. (2007). *Disputing the subject of sex: sexuality and public school controversies*. Lanham: Rowman & Littlefield.

Mazzonna, F. (2014). The long lasting effects of education on old age health: Evidence of gender differences. *Social Science & Medicine*, *101*(0), 129–138. http://doi.org/10.1016/j.socscimed.2013.10.042

Meade, C. S., Kershaw, T. S., & Ickovics, J. R. (2008). The intergenerational cycle of teenage motherhood: An ecological approach. *Health Psychology*, *27*(4), 419.

Meara, E. R., Richards, S., & Cutler, D. M. (2008). The gap gets bigger: changes in mortality and life expectancy, by education, 1981–2000. *Health Affairs*, *27*(2), 350–360.

Mireles-Rios, R., & Romo, L. F. (2014). Latina daughters' childbearing attitudes: The role of maternal expectations and education communication. *Developmental Psychology*, *50*(5), 1553.

Mirowsky, J., & Ross, C. E. (2003). *Education, social status, and health*. Transaction Publishers.

Morgan, S. L., & Winship, C. (2007). *Counterfactuals and causal inference: methods and principles for social research*. New York: Cambridge University Press.

Moynihan, D. P., Rainwater, L., & Yancey, W. L. (1967). *The Negro family: The case for national action*. MIT Press Cambridge, MA.

MTOresearch.org. (n.d.). Retrieved July 31, 2014, from http://www.nber.org/mtopublic/

Mueller, T. E., Gavin, L. E., & Kulkarni, A. (2008). The association between sex education and youth's engagement in sexual intercourse, age at first intercourse, and birth control use at first sex. *Journal of Adolescent Health*, *42*(1), 89–96. http://doi.org/10.1016/j.jadohealth.2007.08.002

Natality Information. (2014). Retrieved February 9, 2014, from http://wonder.cdc.gov/natality.html

National Research Council (U.S.), & National Academy of Education. (2011). *High school dropout, graduation, and completion rates: better data, better measures, better decisions*. (R. M. Hauser & J. A. Koenig, Eds.). Washington, D.C: National Academies Press.

No Child Left Behind Act of 2001, 115 Stat.1425, 20 U.S.C. 6301 et seq. (2002).

Noddings, N. (2013). *Caring: a feminine approach to ethics & moral education*.

Noguera, P. A. (2011). A broader and bolder approach uses education to break the cycle of poverty. *Phi Delta Kappan*, *93*(3), 8–14.

Odem, M. E. (1995). *Delinquent daughters: protecting and policing adolescent female sexuality in the United States, 1885-1920*. Chapel Hill: University of North Carolina Press.

Office of Surveillance, Epidemiology and Laboratory Services. (2011). *Centers for Disease Control and Prevention: CDC vital signs 2011*. Atlanta, GA.

Olshansky, S. J., Antonucci, T., Berkman, L., Binstock, R. H., Boersch-Supan, A., Cacioppo, J. T., Goldman, D. P. (2012). Differences in life expectancy due to race and educational differences are widening, and many may not catch up. *Health Affairs*, *31*(8), 1803–1813.

Pappas, G., Queen, S., Hadden, W., & Fisher, G. (1993). The increasing disparity in mortality between socioeconomic groups in the United States, 1960 and 1986. *New England Journal of Medicine*, *329*(2), 103–109.

Payton, J., Weissberg, R. P., Durlak, J. A., Dymnicki, A. B., Taylor, R. D., Schellinger, K. B., & Pachan, M. (2008). *The Positive Impact of Social and Emotional Learning for Kindergarten to Eighth-Grade Students: Findings from Three Scientific Reviews.* Chicago: Collaborative for Academic, Social, and Emotional Learning.

Pearl, J. (2009). *Causality: models, reasoning, and inference* (2nd ed.). Cambridge, U.K. ; New York: Cambridge University Press.

Petchesky, R. P. (1990). *Abortion and woman's choice: the state, sexuality, and reproductive freedom* (Rev. ed). Boston: Northeastern University Press.

Pillard, C. T. (2007). Our other reproductive choices: Equality in sex education, contraceptive access, and work-family policy. *Emory Law Journal*, *56*, 941–991.

Pillow, W.S. (2003). "Bodies are dangerous": Using feminist genealogy as policy studies methodology. *Journal of Education Policy*, *18*(2), 145–159.

Pillow, W. S. (1997). Decentering Silences/Troubling Irony: Teen Pregnancy's Challenge to Policy Analysis. In C. Marshall (Ed.), *Feminist critical policy analysis*. London; Washington D.C.: Falmer Press.

Pillow, W. S. (2004). *Unfit subjects: educational policy and the teen mother*. New York: RoutledgeFalmer.

Price, J., Price, J., & Simon, K. (2011). Educational gaps in medical care and health behavior: Evidence from US Natality data. *Economics of Education Review*, *30*(5), 838–849.

Reardon, S. F. (2011). The Widening Academic Achievement Gap Between the Rich and the Poor: New Evidence and Possible Explanations. In G. J. Duncan & R. J. Murnane (Eds.), *Whither opportunity?: rising inequality, schools, and children's life chances* (pp. 91–116). New York: Russell Sage Foundation ; Spencer Foundation.

Reese, B. M., Haydon, A. A., Herring, A. H., & Halpern, C. T. (2013). The association between sequences of sexual initiation and the likelihood of teenage pregnancy. *Journal of Adolescent Health*, *52*(2), 228–233. http://doi.org/10.1016/j.jadohealth.2012.06.005

Richards, H., & Barry, R. (1998). US life tables for 1990 by sex, race, and education. *Journal of Forensic Economics*, *11*(1), 9–26.

Rose, S. (2005). Going too far? Sex, sin and social policy. *Social Forces*, *84*(2), 1207–1232.

Ross, C. E., & Mirowsky, J. (2011). The interaction of personal and parental education on health. *Social Science & Medicine*, *72*(4), 591–599. http://doi.org/10.1016/j.socscimed.2010.11.028

Rothstein, R. (1998). *The way we were?: the myths and realities of America's student achievement*. New York: Century Foundation Press.

Rubin, D. B. (1974). Estimating causal effects of treatments in randomized and nonrandomized studies. *Journal of Educational Psychology*, *66*(5), 688–701.

Rumberger, R. W., & Lamb, S. P. (2003). The early employment and further education experiences of high school dropouts: A comparative study of the United States and Australia. *Economics of Education Review*, *22*(4), 353–366.

Sanbonmatsu, L., Kling, J. R., Duncan, G. J., & Brooks-Gunn, J. (2006). Neighborhoods and academic achievement results from the Moving to Opportunity experiment. *Journal of Human Resources*, *41*(4), 649–691.

Saunders, E. J., Landsman, M. J., Graf, N. M., & Richardson, B. (2003). *Evaluation of Abstinence Only Education in Iowa: Year Five Report*. Des Moines, IA: Iowa Department of Public Health.

Sexuality and HIV/STD Education Policies. (2012, September 30). Retrieved July 31, 2014, from http://www.siecus.org/document/docWindow.cfm?fuseaction=document.viewDocument&documentid=208&documentFormatId=267

Shadish, W. R., Cook, T. D., & Campbell, D. T. (2001). *Experimental and quasi-experimental designs for generalized causal inference*. Boston: Houghton Mifflin.

SIECUS - History. (n.d.). Retrieved July 31, 2014, from http://www.siecus.org/index.cfm?fuseaction=Page.viewPage&pageId=493&parentID=472

SIECUS - Sexuality Education Q & A. (2014). Retrieved July 8, 2014, from http://www.siecus.org/index.cfm?fuseaction=page.viewpage&pageid=521&grandparentID=477&parentID=514

SIECUS - State Profiles. (2013). Retrieved June 17, 2013, from http://www.siecus.org/index.cfm?fuseaction=Page.viewPage&pageId=487&parentID=478

Skloot, R. (2011). *The immortal life of Henrietta Lacks* (1st pbk. ed). New York: Broadway Paperbacks.

Social Security Act, Pub. L. No. P.L. 104-193 § 510. Retrieved from http://www.ssa.gov/OP_Home/ssact/title05/0510.htm#ftn23

Sprague, J. (2005). *Feminist methodologies for critical researchers: bridging differences*. Walnut Creek, CA; Lanham, MD: Rowman & Littlefield.

Stack, C. B. (1975). *All our kin: strategies for survival in a Black community*. New York: Harper & Row.

Staiger, D., & Stock, J. H. (1997). Instrumental variables regression with weak instruments. *Econometrica*, *65*(3), 557–586.

State Data Center. (2013, April 1). Retrieved April 4, 2013, from http://www.guttmacher.org/datacenter/servlet/CreateTable?action=doTable

Stefancic, J. (1997). Latino and Latina critical theory: An annotated bibliography. *California Law Review*, 1509–1584.

Tapia, R. C. (2005). Impregnating images: Visions of race, sex, and citizenship in California's teen pregnancy prevention campaigns. *Feminist Media Studies*, *5*(1), 7–22.

Tortolero, S. R., Markham, C. M., Peskin, M. F., Shegog, R., Addy, R. C., Escobar-Chaves, S. L., & Baumler, E. R. (2010). It's your game: Keep it real: Delaying sexual behavior with an effective middle school program. *Journal of Adolescent Health*, *46*(2), 169–179.

Trussell, J. (1988). Teenage pregnancy in the United States. *Family Planning Perspectives*, *20*(6), 262–272.

Tyler, J. H., & Kling, J. R. (2006). *Prison-based education and re-entry into the mainstream labor market*. National Bureau of Economic Research.

Valdes, F. (1996). Latina/o ethnicities, critical race theory, and post-identity politics in postmodern legal culture: From practices to possibilites. *La Raza LJ*, *9*, 1.

Waldfogel, J., Garfinkel, I., & Kelly, B. (2007). Welfare and the costs of public assistance. In C. R. Belfield & H. M. Levin (Eds.), *The price we pay: Economic and social consequences of inadequate education* (pp. 160–174). Brookings Institution Press.

Walsemann, K. M., Gee, G. C., & Ro, A. (2013). Educational attainment in the context of social inequality: New directions for research on education and health. *American Behavioral Scientist*, *57*(8), 1082–1104. http://doi.org/10.1177/0002764213487346

Webbink, D., Martin, N. G., & Visscher, P. M. (2010). Does education reduce the probability of being overweight? *Journal of Health Economics*, *29*(1), 29–38.

Weiss, A. (1995). Human capital vs. signalling explanations of wages. *The Journal of Economic Perspectives*, 133–154.

Welch, F. (1973). Black-white differences in returns to schooling. *The American Economic Review*, 893–907.

Whitaker, S. (2011). The impact of legalized abortion on high school graduation through selection and composition. *Economics of Education Review*, *30*, 228–246.

Wilkinson-Lee, A. M., Russell, S. T., & Lee, F. C. (2006). Practitioners' perspectives on cultural sensitivity in Latina/o teen pregnancy prevention. *Family Relations*, *55*(3), 376–389.

Williams, D. R., & Mohammed, S. A. (2013). Racism and health II: A needed research agenda for effective interventions. *American Behavioral Scientist*, 0002764213487341.

Wilson, W. J. (2012). *The truly disadvantaged: the inner city, the underclass, and public policy* (Second edition). Chicago ; London: University of Chicago Press.

Wooldridge, J. (2013). *Introductory econometrics: a modern approach* (5th ed). Mason, OH: South-Western Cengage Learning.

Yang, Z., & Gaydos, L. M. (2010). Reasons for and challenges of recent increases in teen birth rates: A study of family planning service policies and demographic changes at the state level. *Journal of Adolescent Health*, *46*, 517–524.

Young, M., & Goldfarb, E. S. (2000). The problematic (a)-(h) in abstinence education. *Journal of Sex Education & Therapy*, *25*(2 & 3), 156–160.

Zajacova, A., Rogers, R. G., & Johnson-Lawrence, V. (2012). Glitch in the gradient: Additional education does not uniformly equal better health. *Social Science & Medicine*, *75*(11), 2007–2012.

Zerilli, L. M. G. (2005). *Feminism and the abyss of freedom*. Chicago: University of Chicago Press.